THE REFINER AND NATURAL GASOLINE MANUFACTURER

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Advertising Eliminates Jobber. Method Used by Kentucky Refiner Makes Output Assured.

Richfield Plant Complete Refining Unit.

Description of Trumble Process for Extracting Gasoline From Shale

Pointers on Care of Breaker Box as Told by Plant Superintendent at recent Gasoline Men's Meet.

Vol. 3 No. 10 Oct., 1924 $1.00 Per Year

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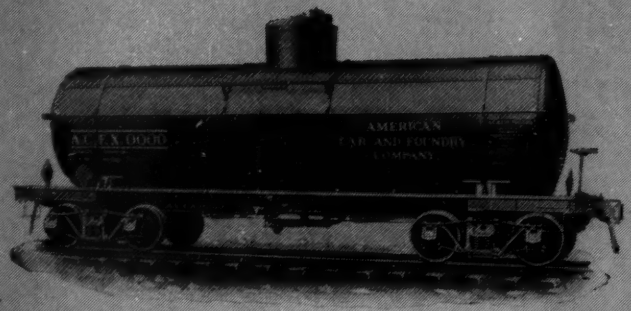
for All Purposes



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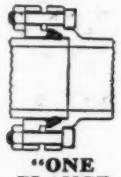

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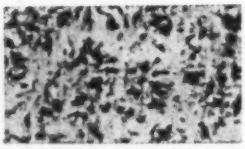
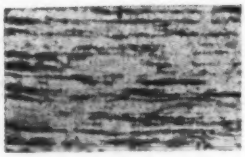
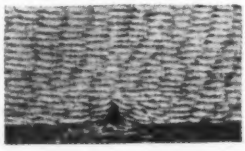


Photomicrograph of cast iron, much enlarged, showing granular structure.



Photomicrograph of wrought iron, much enlarged, showing fibrous structure.



A piece of sheet steel, much enlarged, showing surface and sectional structure with a typical pit.

AUTHENTIC data from over 250 years of service prove that cast iron becomes coated with rust but remains practically unimpaired in weight and strength under conditions that are fatal to other kinds of metal.

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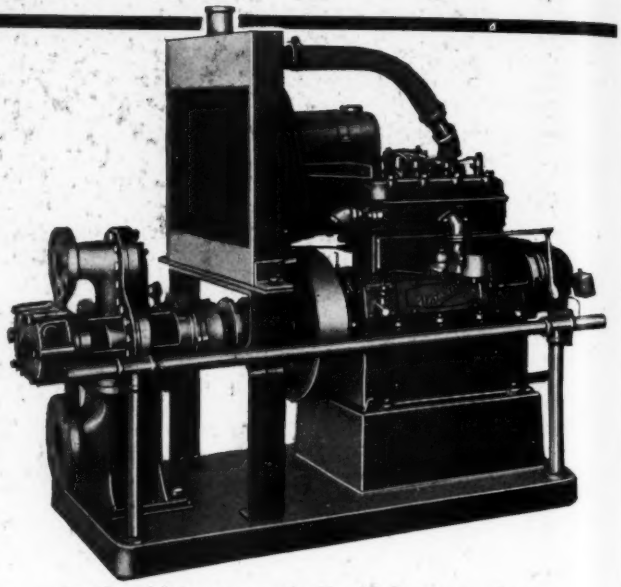

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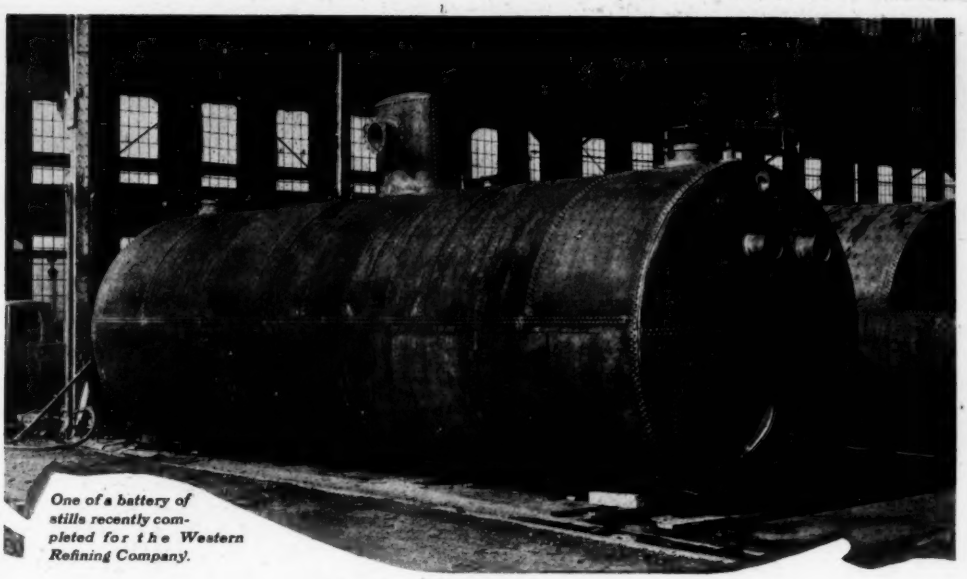

One of a battery of stills recently completed for the Western Refining Company.

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This Company numbers practically every refiner on the Pacific Slope among its clients. This is no doubt due to our ability through our unexcelled facilities and locations to manufacture a better product and render a superior service.

We not only design and construct standard refinery equipment but are well equipped to handle special requirements of all kinds. Why not consult our experienced engineering department in regard to your next installation—there's no obligation.

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Designers, Fabricators & Erectors of General Plate Work

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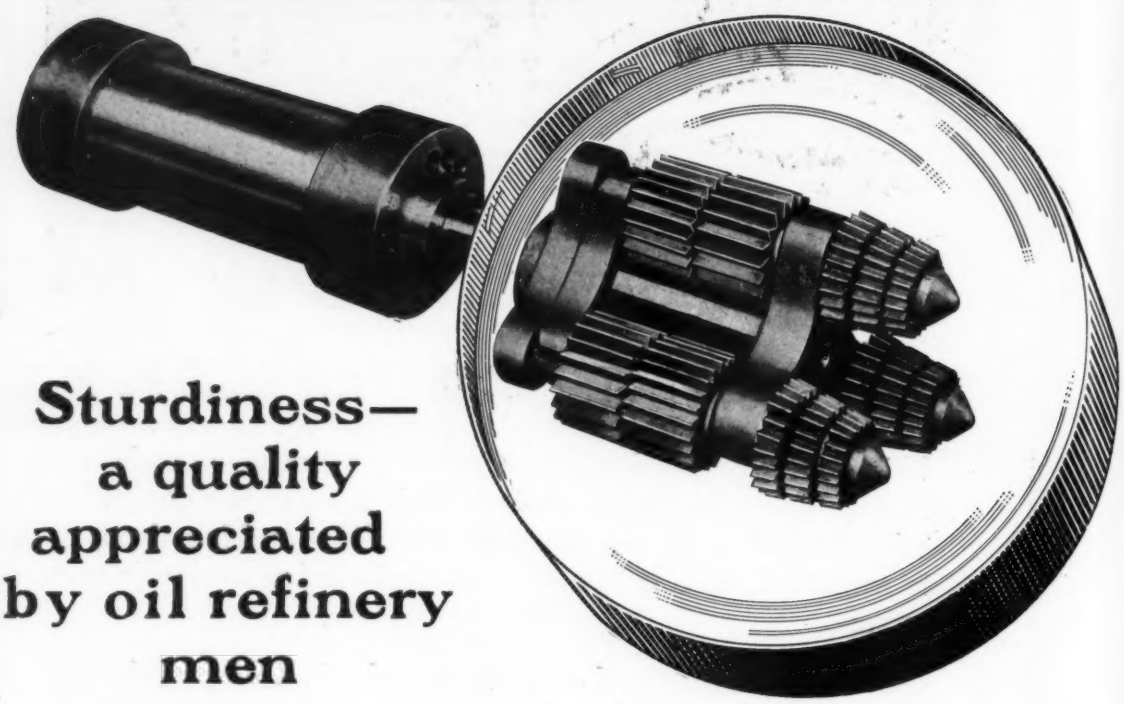

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Cleaning the hard coke deposits which form in the tubes of pressure stills, is a severe test for any Tube Cleaner. It requires real power in the motor, and rugged sturdiness, as well as supreme scale cleaning ability in the cutter head.

The Liberty Type "SF" Head, illustrated above, in connection with the Victor Pneumatic motor, combines large cutting surface with the utmost simplicity of construction. It is ruggedly and heavily built;—nothing to wear but the cutters, and perhaps the cutter pins slightly.

No arms, no arm pins, etc. The head comes apart by simply removing it from the shaft of the Cleaner, when the head lock on the rear end lifts off, releasing cutters and pin.

Liberty Tube Cleaners are made in several types for all sizes of tubes, straight or curved water tubes; also for fire tube boilers.

Ask for our Catalog Z-1.

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449 Grant Street, Pittsburgh, Pa.

Z-992

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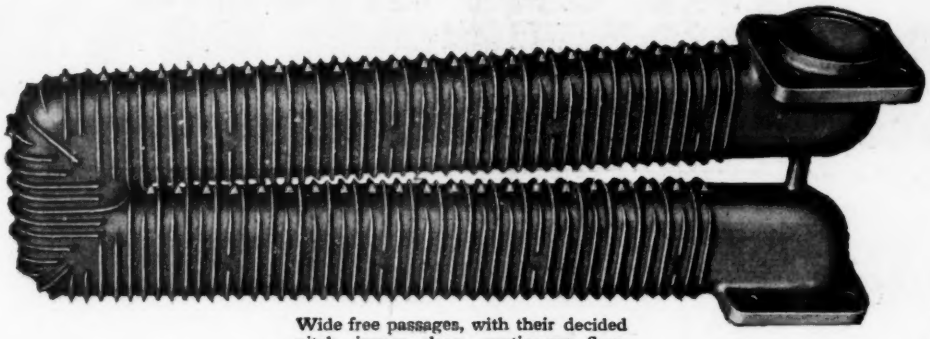

Wide free passages, with their decided pitch, insure clean, continuous flow. Save box room and installation expense.

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THE GREAT FLEXIBILITY of the Sterling Run Down Section in combination with the Sterling Condensing Section is indicated by the diagram on the right; innumerable combinations are possible. Installation is easy. Removal of units is simplicity itself.

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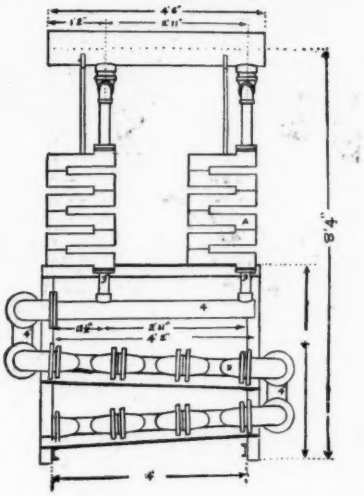
Cast Iron Pipe Companion Flanges, 12″ and 24″, as well as Sterling Run Down Sections, are now available from stock at Buffalo.

Write Dept. 5250 for the facts.



Specifications for new
STERLING
RUN DOWN SECTION

Weight, 185 lbs.
Contains 17 sq. ft. per section.
Length, 45 11/16″ over all.
Width, 16″ over all.
Thickness, 7 7/8″ over all.
Flanged openings, 4″.
Companion Flanges tapped, 4″
Cross section area, 13.06 sq. in.

To be used in connection with Sterling Condensing Section.

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STERLING CONDENSING SECTIONS ARE IMMEDIATELY AVAILABLE AT OUR PLANTS IN
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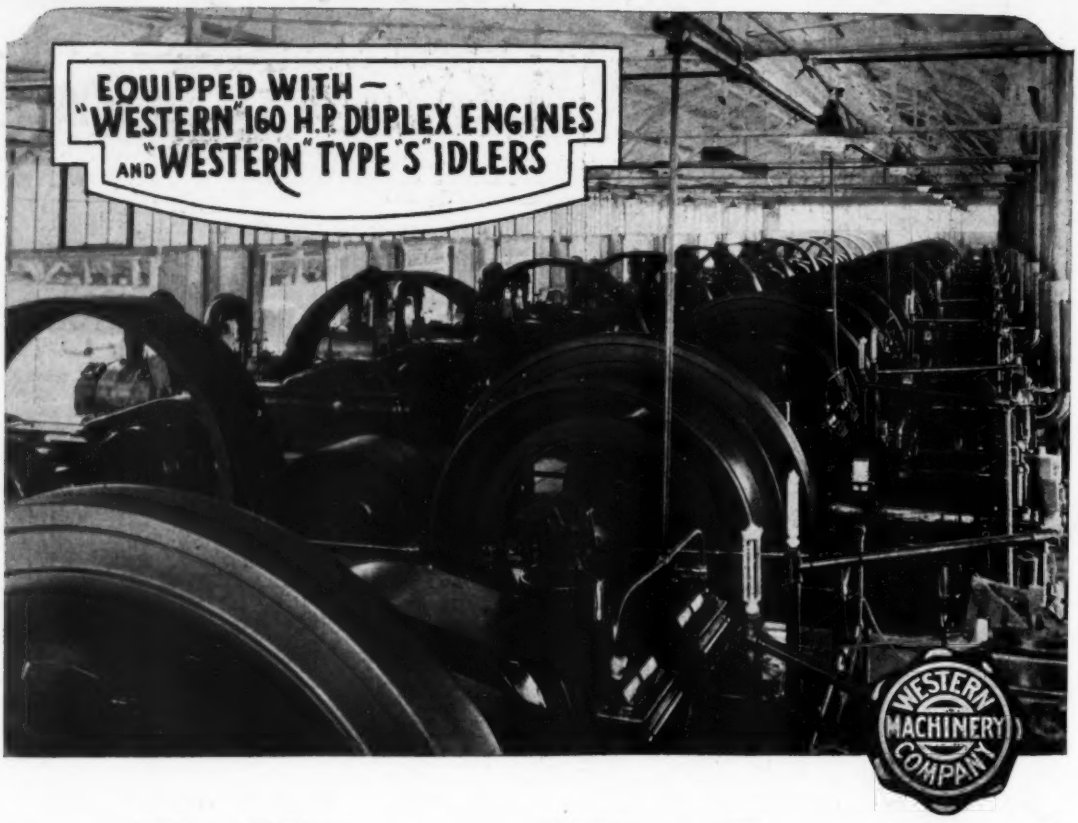

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Idlers: 36"x24", phosphor bronze bearings, mounted in steel frame—mean minimum floor space and no slippage between engine and compressor.

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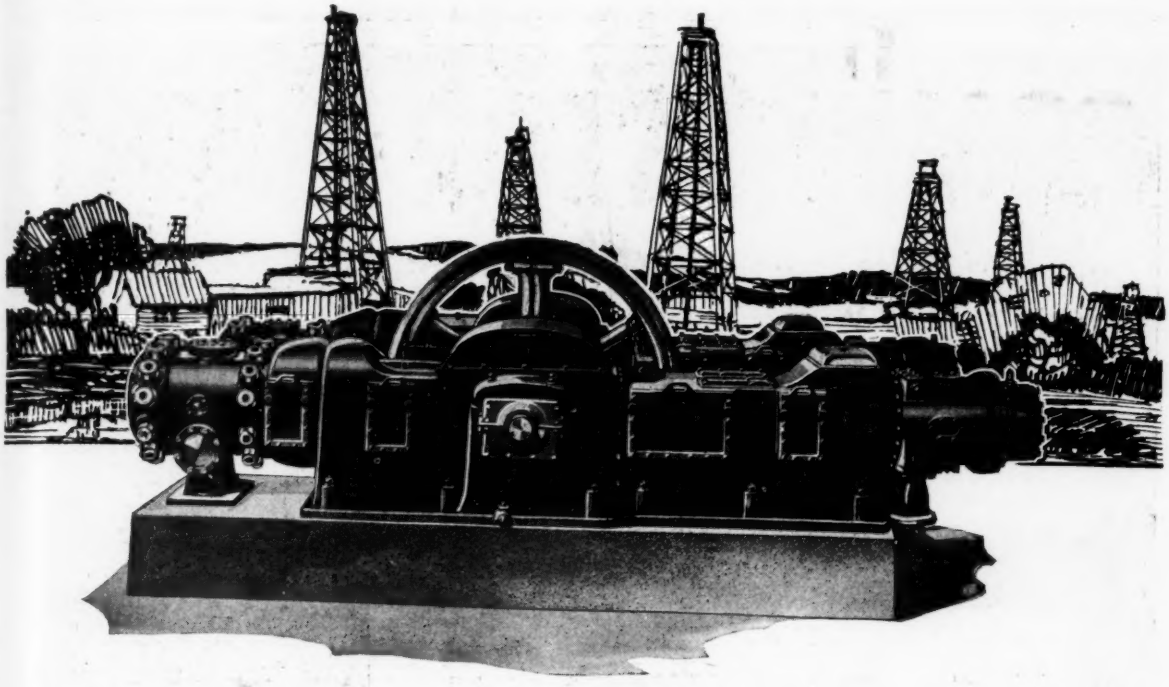

More Running Time With Bessemers

THE operating records of compressor plants tell the story of Bessemer compressors briefly and to the point. Hundreds of such records give Bessemers an average running time of 99% plus, far exceeding that of any similar equipment of which we know.

The fact that Bessemer-equipped gasoline plants get more running hours over a longer period with less upkeep expense, accounts for the standardization of over 90% of the country's gasoline plants on Bessemers.

THE BESSEMER GAS ENGINE COMPANY
18 York Street Grove City, Pa.

BESSEMER

BESSEMER OIL FIELD ENGINES – COMPRESSORS VACUUM PUMPS – ROLLER PUMPING POWERS

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Notice Who They Are For

The above photograph of the Cooper main essembly floor was taken on July 30. It shows gas engines and compressors for practically every oil and gas district in the country.

The four 485 H.P. gas engines are the last of an order for fourteen from the United Fuel Gas Co. for West Virginia. The compressors on the railway car and one of the 60 K.W. electric generator units in the background are for the same company. Among the smaller engines there are four 60 K.W. electric generator units for Magnolia Gas Co. This same order calls for ten of the 970 H.P. engines for the two big stations now being built in Louisiana and Texas.

The photograph also shows two 160 H.P. engines for The Peoples Natural Gas Co. of Pittsburgh, two 160 H.P. engines for the Humble Oil & Refining Co. in Texas, four 160 H.P. engines for Missouri Power & Light Co. in Oklahoma, two 160 H.P. engines for the Central Kentucky Natural Gas Co. in Kentucky and two 160 H.P. engines for the Midway Gas Co. in California. Just out of sight, but coming onto the floor are parts for twelve compressor cylinders for the Midwest Refining Co. in Wyoming.

A recent visitor's conclusion was, Cooper workmen build greater satisfaction into Cooper equipment and the trade appreciates it.

You can't tell whether a man is from California, Wyoming, Texas or Pennsylvania when he starts telling you about Cooper engines for they all boost alike.

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The REFINER and NATURAL GASOLINE MANUFACTURER
Published Monthly by GULF PUBLISHING Co. Houston, Texas
For men engaged in the operating branch of the refining and natural gasoline business.
Vol. 3 October No. 10

R. L. DUDLEY, President and Publisher
Price .....$1 per year
Advertising rates upon application to nearest office.
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New Grade Natural Gasoline Adopted

Gravity changes most radical in effort to eliminate misunderstanding with refiners

THROUGH its specifications committee the Association of Natural Gasoline Manufacturers has announced new specifications on the various grades of natural gasoline, effective October 1, 1924. Grade "D" has been entirely eliminated in the new specifications and grade "Double A" and "Double B" added. The vital change in the specifications has been made in the gravity.

It is believed that this change will result in doing away with much of the misunderstanding and differences between natural gasoline manufacturers and refiners throughout the country and will react to the betterment of the entire industry.

The specifications committee of the Association of Natural Gasoline Manufacturers is composed of A. M. Ballard, chairman, and L. F. Bayer, A. F. Wood, H. A. Trower and John M. Hall.

The new specifications follow:

Natural Gasoline

Grade "Double A"—

Recovery	Not less than 90%
End Point	Not over 375° F.
Gravity	80.0 to 87.9° Be.

Grade "A"—

Recovery	Not less than 90%
End Point	Not over 375° F.
Gravity	72.0 to 79.9° Be.

Grade "Double B"—

Recovery	Not less than 85%
End Point	Not over 375° F.
Gravity	84.0 to 92.0° Be.

Grade "B"—

Recovery	Not less than 85%
End Point	Not over 375° F.
Gravity	76.0 to 83.9° Be.

Grade "C"—

Recovery	Not less than 78%
End Point	Not over 375° F.
Gravity	80.0 to 90.0° Be.

In regard to the new specifications the association has issued this official statement explanatory of the changes now in effect:

"The color of all products must be water white, plus 25 Saybolt chronometer. All tests are to be made in accordance with the latest approved methods of the American Society for Testing Materials, with the additional provisions which follow and which are expected to be adopted by the A. S. T. M. in the tentative standard distillation test of natural gasoline.

"Samples should be held and measured at a temperature of 32° to 40° F. The temperature of the condenser bath should be maintained between 32° and 34° F., stirring or agitating with an air jet to insure circulation. The receiving cylinder may be surrounded in an ice water bath between 32° and 40° F. The heat shall be regulated so that the first 10 cc of distillate shall be recovered in not less than three nor more than four minutes and the rate thereafter maintained uniformly at not less than four nor more than five cc per minute. When the liquid residue in the distillation flask is approximately five cc, the heat may be increased because of the presence of the heavy ends which have relatively high boiling points. However, no further increase of heat shall be applied after this adjustment. The four to five cc rate cannot always be maintained from this point to the end of the distillation, but in no case should the period between the point when approximately five cc of the liquid remains in the flask and the end point be more than five minutes. The heating shall be continued until the mercury reaches a maximum and starts to fall consistently. The highest temperature observed on the distillation thermometer shall be recorded as the maximum temperature or end point. Usually this point will be reached after the bottom of the flask has become dry.

"All products shall be shipped according to regulations of the I. C. C. which follow the Bureau of Explosives regulations and methods of tests. The I. C. C. regulations provide as follows in regard to vapor tension:

"Paragraph 412, (a) Casinghead Gasoline—Liquid condensates from natural gas or from the casinghead gas of oil wells, made either by the compression or absorption process, alone or blended with other products, must be described as casinghead gasoline when the vapor pressure at 100° F. (90° F. Nov. 1 to March 1) exceeds 10 pounds per square inch, and does not exceed 20 pounds. Such products must be shipped in insulated class 4 tank cars.

"Paragraph 412, (c)—When the vapor pressure of such condensates or blends does not exceed 10 pounds at 100° F. (90° F. Nov. 1 to March 1), these condensates or blends must be described as gasoline. Such products may be shipped in ordinary Class 2, or Class 3 tank cars, or in insulated Class 4 tank cars."

Directors of the American Petroleum Institute in session in New York on October 21st selected Fort Worth, Texas, for the next annual meeting and fixed December 9, 10 and 11 as the dates.

The program and other arrangements will be announced later.

A Revolutionary Advance

—in the art of constructing stills, tanks and other vessels for high pressures or extremes in expansion and contraction is expressed in the words

HAMMER WELDING

Blaw-Knox Hammer Welded Oil Cracking Equipment is absolutely safe for your conditions.

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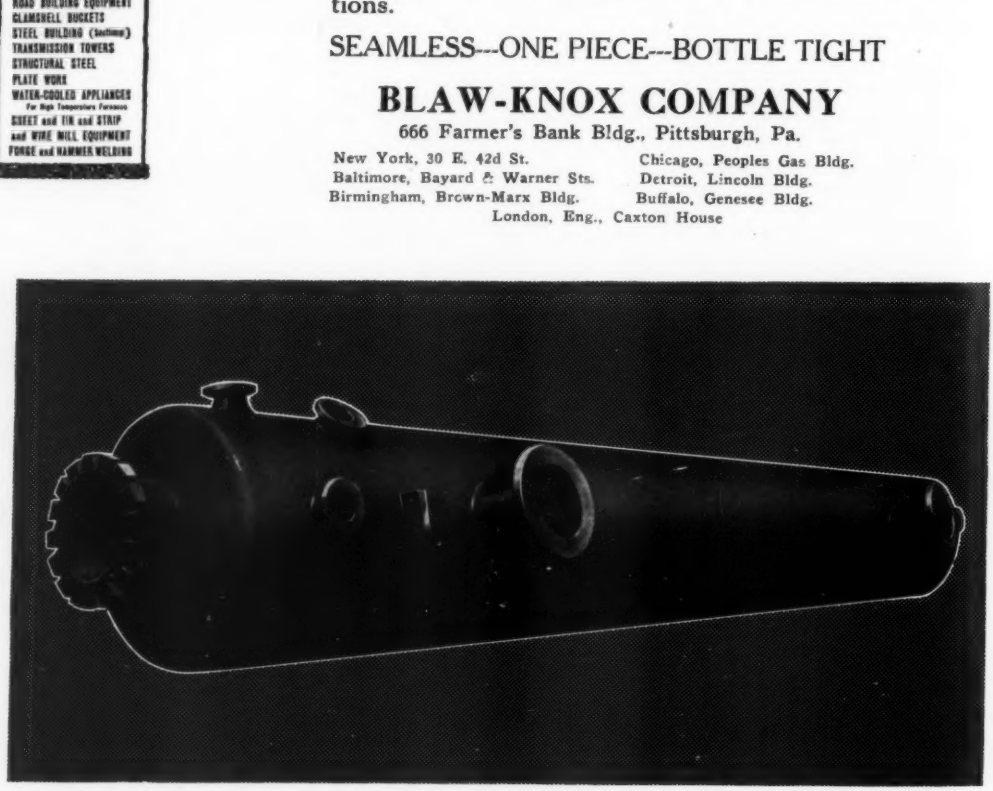

Blaw-Knox Forge and Hammer Welded Expansion Tank.

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LIBRARY
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EL SEGUNDO, CAL.

Possibilities in the Low Pressure Cracking of Low Grade Fuel Oil

By Carl J. von Bibra
Chemical Engineer

THE so-called cracking of oils was accidentally discovered in 1861, only a few years after the birth of the petroleum industry. It is therefore a relatively old operation as compared with many of the methods of modern refinery technology. Engler[1] gives a most satisfactory and brief definition of cracking by terming it "a thermal decomposition of hydrocarbons having a high specific gravity, boiling point and molecular weight into hydrocarbons of low specific gravity and molecular weight and consisting for the most part of liquid substances of low boiling point."

Although, as stated above, the operation of cracking is a relatively old one, it has had a most varied and singularly unsatisfactory development. This is due in part to the changing of the objectives to be attained but most of all to the great difficulties encountered in applying in actual practice the quite obvious theoretical principles of the operation. In regard to the former it must be borne in mind that for the first forty or more years after its discovery the principal aim of inventors in this field was to perfect a process which would substantially increase the yield of kerosene. With this purpose in view more than thirty distinct processes were invented, all of them more or less satisfactory. The most successful by far was that of Redwood and Dewar, patented in 1889.[2]

While the size of the kerosene fraction was the chief consideration there was still another which aroused considerable activity during this period, viz., cracking for aromatic hydrocarbons. Efforts in this direction were re-

Purpose Changes

The last two decades have witnessed a most remarkable increase in the use of internal combustion engines. Keeping pace with this development has been the demand for the lighter petroleum distillates. The burning oil fraction has long since ceased to be the most desirable one. This being the case, the interest in cracking processes laxed for some time but within the last few years have been renewed with great vigor due to the stupendous demand for benzene and toluene resulting from the war.

has shifted from those which enhanced the kerosene fraction to those which enabled the refiner to produce the largest percentage of gasoline.

This, then, is the status of affairs at present. A cracking process, in order to be commercially successful, must produce a large yield of gasoline.

Physico-Chemical Principles

Considering the operation of cracking from the point of view of the kinetic theory[3] we quite naturally reach the following conclusions:

1. The amount of cracking varies directly with the temperature. The rate of vibration of the molecules varies in this manner and their cracking is obviously due to the violence and frequency of impact.

The Nernst equation

$$Q = RT^2 x \frac{d}{dt} \log_e K,$$

in which Q is the heat of reaction, R is the gas constant, T the absolute temperature and K the equilibrium constant, serves very well to calculate the temperature coefficient

$$\left(\frac{d}{dt} \cdot \log_e K\right)$$

of the reaction velocity. This temperature coefficient is very constant and almost invariably (in any chemical reaction) is about doubled for a rise in temperature of 10 degrees C.

2. Large molecules are more readily cracked than small ones. e. g. Assuming that the rates of vibration are equal, the molecules of greater molecular weight would possess a greater momentum and therefore would impinge with greater violence.

Egloff and Moore[4] have, by a large amount of painstaking work, succeeded in proving that the lower paraffin hydrocarbons are not more stable to the action of heat than are the higher ones, provided that the experimental conditions of temperature and pressure regulation are almost ideal. This does not effect in any way, however, the assertion first made since the conditions under which cracking operations are carried out are very far from ideal at best.

3. Paraffin hydrocarbons are more readily cracked than those of the Cyclic series. This is due to the fact that the structure of the latter is much more compact than that of the paraffins. Also, open-chain, unsaturated hydrocarbons such as the olefines decompose much more readily than the saturated paraffins of higher molecular weight. Likewise unsaturated Cyclic hydrocarbons (e. g. Terpenes) of high molecular weight can be cracked with greater ease than those which are saturated, for instance the naphthenes.

Cracking is essentially the result of an attempt to establish in a given body of oil or oil-vapor that state of equilibrium which corresponds to the working conditions which obtain. These may be classified as temperature, pressure and rate. The latter may be determined by the mechanical design of the apparatus or by catalytic action or both.

Berthelot[5] was the first to advance this theory of the nature of cracking. Since then several authors have refuted it.[6] The verity of Berthelot's assertion is proved beyond a doubt, however, by the work of Snelling[7] in the synthesis of crude oil from any petroleum fraction from very light gasoline to hard paraffin wax. The fundamental truth of this equilibrium notion of the nature of cracking was assumed in the work to be described later in this paper.

When considering the cracking operation as the establishment of an equilibrium it is also well to bear in mind the theorem of Le Chatelier. This may be stated as follows: When one or more of the factors determining an equilibrium is altered, the equilibrium becomes displaced in such a way as to neutralize, as far as possible, the effect of the change. The application of this theorem to hydrocarbon reactions is very well illustrated by the following simple but excellent type reactions mentioned by Dunstan and Thole.[8]

In the change $C + 2H_2 = CH_4 + 21{,}750$ cal. heat is set free during the synthesis of methane. Consequently, if heat is admitted to the system the equilibrium is displaced in such a direction that heat is absorbed, i. e., the dissociation of the methane sets in. The above reaction also takes place with diminution of volume. Consequently the formation of methane varies directly with the pressure. On the other hand, it varies inversely with the rise in temperature since the reaction is an exathermic one.

Equilibrium Difficult

It may be said that high pressure generally favors synthesis or polymerization while low pressure has the opposite effect. It favors the formation of dissociated products.

The matter of obtaining an equilibrium condition favorable for cracking is made extremely complicated, however, by the role which pressure plays in regard to concentration. According to Gulberg and Waage's Law of Mass

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[1] Das Erdoel, Engler-Hoefer, Vol. 1, p. 565.

[2] English Patent 10,277; U. S. Patent 419,931 (1890.)

[3] Das Erdoel ,Engler-Hoefer, Vol 1, p. 565. Buretu of Mines Bulletin 114, Rittman, p. 106.

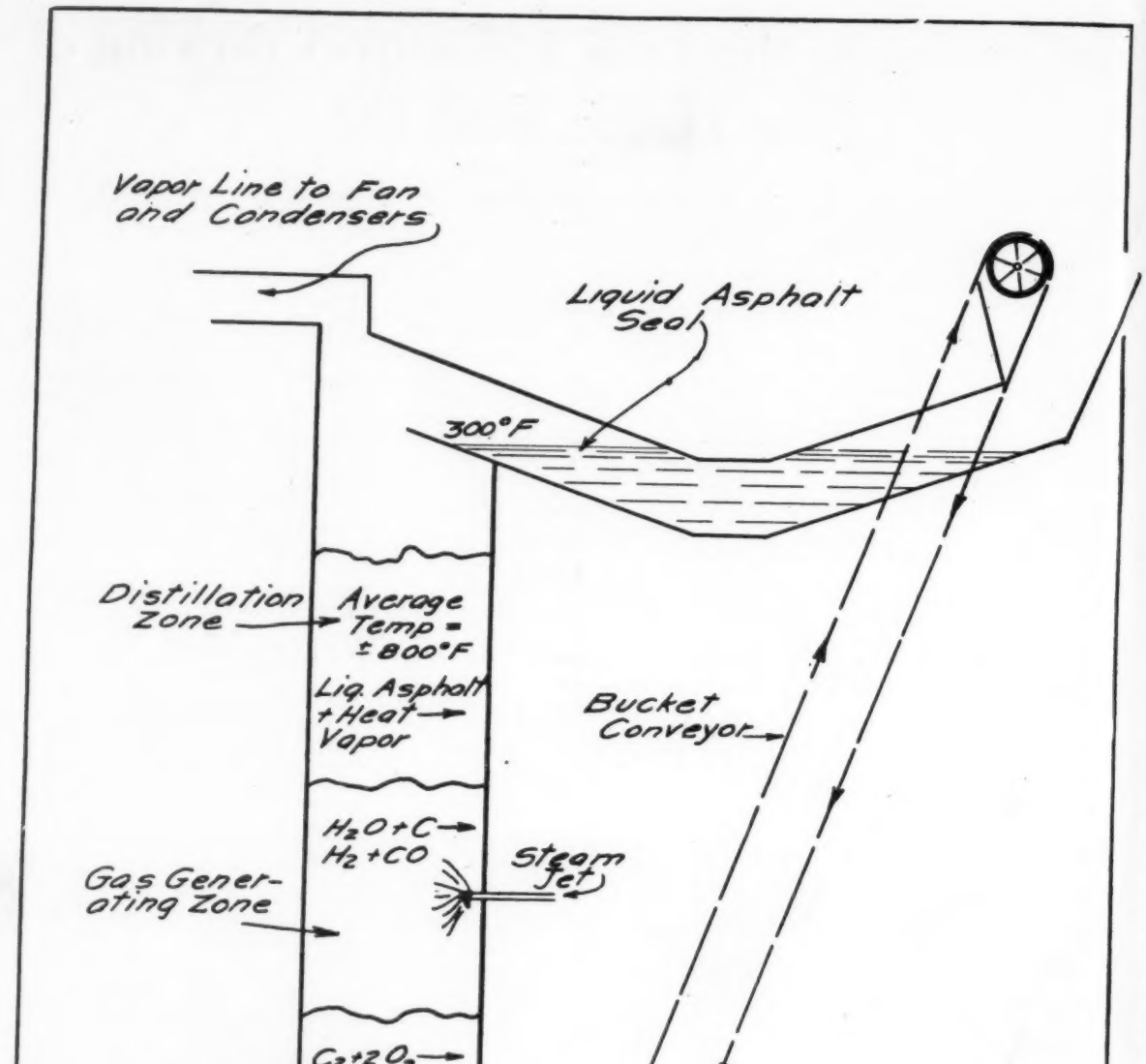
[4] Met. & Chem. Eng., Jan. 1, 1917, p. 47.

[5] Berthelot, M. P. E., Compt. Rend. Vol. 62, pp. 905, 947 (1866.) Ibid, Vol. 63, pp. 788, 834 (1866.) Bull. Soc. Chim. Paris, 2, Vol. 7, p. 217 (1867.)

[6] Proc. Roy. Soc., Thorpe & Young, Vol. 19, p. 370: Vol. 20, p. 488: Vol. 21, p. 184 (1871-1873.) Chem. News, Armstrong & Miller, Vol. 49, p. 285 (1884.) Journ. Chem. Soc. do., Vol. 49, p. 74 (1886.) Ber. Deutsch. Chem. Ges., Haber, Vol. 29, p. 2691 (1886.) Journ. Chem. Soc., Bone & Coward, Vol. 93, p. 1197 (1908.)

[7] Trans. Am. Inst. Min. Eng., Vol. 51, p. 657 (1915.)

[8] Journ. Ind. Eng. Chem., Vol. 9, pp. 889, 896 (1917.)


Vapor Line to Fan and Condensers
Liquid Asphalt Seal
300°F
Distillation Zone
Average Temp = ± 800°F
Lig. Asphalt + Heat → Vapor
Bucket Conveyor
$H_2O + C \rightarrow H_2 + CO$
Steam Jet
Gas Generating Zone
$C_2 + 2O_2 \rightarrow 2CO_2$
Combustion Zone
Air Preheating Zone
Grate
Air in
Sketch of Apparatus for
ASPHALT CRACKING PROCESS

Action[9] the velocity of reaction varies directly with the concentration of the reacting substances and their products. Thus the reaction $C_2H_6 = C_2H_4 + H_2$ will reach equilibrium when certain limiting concentrations of the gases are reached provided the hydrogen is kept within the sphere of operation. If more hydrogen is added the ethylene is reduced and the equilibrium thus readjusted. Lastly, if the hydrogen is removed the ethane is completely dissociated.

It will readily be seen that one of the major difficulties in the development of a cracking process lies in the fact that increasing the pressure facilitates the hydrogenation of unsaturated compounds and carbon while at the same time it retards the breaking down of paraffins into olefines.

There still remains to be considered the third determining factor of the equilibrium condition which the cracking operation tends to establish, namely that of rate. Leaving out of consideration for the time being the variation of reaction rate due to mechanical structure of the apparatus we will briefly touch upon the role played by catalysis in the reaction. In the first place a catalyst is a substance which accelerates a reaction. The three most important characteristics of a catalyst are the following: (1) a relatively small amount of the catalyst is capable of effecting the transformation of a large amount of material; (2) a catalyst does not initiate a reaction but simply promotes it; and (3) the equilibrium is not disturbed by the presence of a catalyst since the velocities of the direct and reverse reactions are each altered to the same extent.[10]

Catalysis is of the utmost importance in the cracking of oil despite the fact that the presence of very slight amounts of sulphur compounds will poison the catalysts, in the great majority of cases. Were it not for the use of a catalyst of some sort a great number of the processes which have been proposed or are actually in use would either be entirely too slow to be commercially feasible or else would require a technically impossible combination of temperature and pressure. As a matter of fact every cracking process is subjected to a certain amount of catalytic action simply by virtue of its being conducted in an iron apparatus, iron being a potent catalyst under a great variety of conditions.

The choice of the catalyst is governed entirely by the nature of the process concerned, i. e., whether it operates in the liquid or vapor phases, the temperature and pressure under which it is operated, etc. Thus, most catalysts cease to act when a temperature close to 400 degrees C. is reached. Copper, on the other hand, just begins to be active at that temperature.

Catalytic action may be employed in several ways in the cracking of oils. The reaction to be accelerated may be the decomposing one or else it may be desired to facilitate the hydrogenation of the cracked product. Usually both reactions are effected simultaneously by the same catalyst.

Chemical Change

The chemical change involved in the cracking of oil is popularly expressed by the reaction

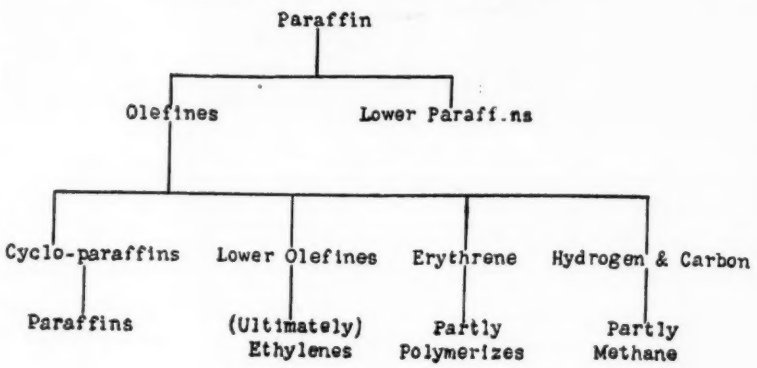
$$\underset{\text{Higer Paraffin}}{C_nH_{2n-2}} = \underset{\text{Lower Paraffin}}{C_{n-p}H_{(n-p)-2}} + \underset{\text{Olefine}}{C_pH_{2p}}$$

While this serves to give somewhat of an idea as to what takes place it certainly does not by any means express what actually happens. To be sure, this equation indicates what would happen if a single paraffin hydrocarbon were decomposed. Petroleum, however, is a heterogeneous mixture of an infinite variety of hydrocarbons. Woehler, after refractionating a certain cut several hundred times in order to isolate one of its constituents, gave up the task in disgust, declaring petroleum to be "ein unentwirbares Gemisch" (a mixture which cannot be disentangled).

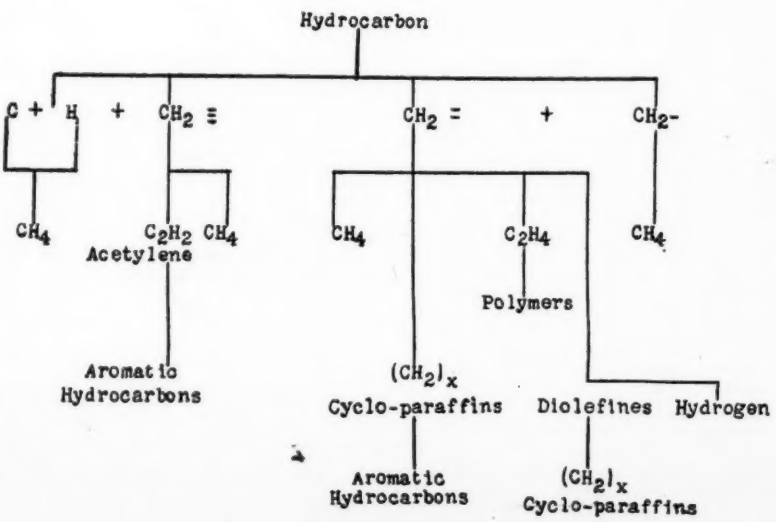
To carry out in a heterogeneous mixture the reaction expressed by the above equation would require the attaining of the optimum temperature needed by each compound decomposed in this manner. This is manifestly impossible.

What actually does happen when a hydrocarbon mixture is cracked is an extremely interesting and decidely complex matter[11]. To go into a full discussion of this question is beyond the scope of this paper, suffice it to say that the thermal decomposition of crude oil consisting largely of paraffins may be made to take place according to either one of the schemes expressed in the following diagram[12]. The degree to which a given decomposition will follow either of these cracking schemes depends on the temperature, pressure, etc.

Cracking at the Lowest Possible Temperature



CRACKING AT HIGHER TEMPERATURES.



[9]As originally stated, "The amount of chemical action at any stage of a reaction is proportional to the active masses of the reacting substances present at that time."
Journ. Prakt. Chem. 2, Vol. 19, p. 69 (1879.) Etudes sur les affinites Chimiques.

[10]Outlines of Theoretical Chemistry, Getman, p. 329 (1913.)

[11]For a thorough discussion see Journ. Ind. Eng. Chem., Vol. 9, p. 897 (1917), Dunstan & Thole.

[12]Ibid.

Methods for Getting a Tight Pipe Joint

Knowledge of pipe and dies essential around natural gasoline plants

PERHAPS the most vexing problem around a refinery or gasoline plant is that of leaking pipe connections.

When G. P. Crutchfield of Roser and Pendleton read his paper on "Prevention of Wastes and Leaks," at the August 13 meeting of gasoline plant operators at Breckenridge, the discussion turned immediately to methods of getting a tight pipe joint.

While this discussion arrived at the conclusion that the perfect pipe joint is something of an ideal, seldom reached, many suggestions were made that have been found effective for reducing waste through leaking pipe joints. This report is taken from Mr. Crutchfield's paper, the discussion that followed it and references to authorities on tubular connections.

It is a common agreement that the time to prepare for a tight pipe joint is at the time of cutting the thread. Cutting a thread depends largely on the dies and their use. The chapter on pipe standards from the Handbook of the Petroleum Industry has this to say of thread cutting:

"To secure good threaded joints it is necessary to have clean, smoothly cut threads of the proper taper and pitch; and to secure such threads it is necessary to have threading dies made with full consideration for the following points: lip, chip space, clearance, lead, and, in the case of power machines, number of chasers."

Preparation and care of threading equipment are matters that demand mechanical knowledge and constant attention. The common opinion of gasoline plant operators at the Breckenridge meeting was that the plant superintendent should look after his threading equipment personally. Even when dies are properly cut, their use may vary with different classes of pipe and this is another step that the superintendent should follow, unless he has a man capable of looking to care and use of the dies.

The man using dies may not have the knowledge of what should be done to make dies cut properly but he can determine when his dies are not cutting properly. When dies are cutting properly, chips from the pipe come off in spiral form, curling as they leave the dies. The angle at which the lip of the chaser is ground leaves the spiral chip and this angle should change with different classes of pipe.

The proper angle is something the superintendent should know how to adjust. If the operator of a die can not correct the trouble, he can know that his threads will be defective, or may be defective, from the crumbling chips that leave the die.

While it may be the duty of a plant superintendent to look to the condition of his threading equipment, its use is in the hands of men, who can determine the quality of the work by their use of the dies. These paragraphs from the "Handbook of the Petroleum Industry" are worth the reading of any man, who has work around a refinery or a gasoline plant:

"Oil—Care should be taken in the quality of oil used, as the best die will not produce good results with poor or insufficient oil.

3 or 4 Threads Imperfect Top and Bottom
2 Threads Perfect at Root Imperfect at Top
Perfect Thread "L"
$L = \frac{0.8\ D + 4.8}{n}$
60°
$P = \frac{1}{n}$
Taper 1/32" per Inch
$H = \frac{0.8}{n}$
$T = .0175\ D + 0.025$
O.D. of Pipe

Briggs Standard Thread, showing how some are imperfect

"For use on hand tools or where the flow is intermittent, No. 1 lard oil can be used with success, as cottonseed oils have a tendency to gum up if not used in a constant flow.

"Experience of experts shows that the very best lard oil is the best lubricant. Cheap lubricant is destructive to dies, and more power is required to perform work when it is used.

"A mixture particularly adapted to power machines where there is a steady flow of lubricant, which will give good results, and is comparatively inexpensive, is composed of 50 per cent cottonseed oil and 50 per cent light neutral oil.

"Care and repair of dies—To get the best results with the dies now made, the user should bear in mind certain rules promulgated by the die manufacturer.

"Where a die of two or more chasers is used, care should be used to see that the letter and number of each chaser corresponds, as all chasers in a die set have both the same letter and number; for instance, W360 or CB360. A chaser marked W360 would not operate satisfactorily with a chaser from another die set marked CB360. If chasers from two or more separte sets are used in one die, the lead threads may not follow in proper order. * * * * In many cases it has been found that only the number of a chaser has been noted and no attention has been paid to the serial letter, and as a consequence the pipe and die have both been condemned, first the pipe for being too hard to cut, and second, the die for being defective. * * * When chasers are placed in holder, care should be taken to have them set at equal distances from center of holder. Chasers set 'out of center' will generally cut an imperfect thread."

One fact the pipe worker should consider always is that all threads cut with perfect dies and under proper conditions are not perfect threads. "Shoulder threads" are imperfect. This is the basis for the common expression that the "shoulder joint" never should be made.

This imperfection of the several threads farthest from the end of the pipe is illustrated by the drawing of the Briggs standard thread, taken from the "Handbook of the Petroleum Industry." The perfect threads extend for the distance of "L" in the drawing. The next two threads are perfect at the bottom but imperfect at the top. The next three or four threads are imperfect at the top and bottom.

This imperfection of six threads on a pipe joint make it necessary that all pipe be cut to allow the making of a joint without the use of these threads, provided the joint is to be subjected to the heat and pressure common around refining and gasoline plants.

Imperfection of these threads is the basis for the common statement that the "all thread nipple" is undesirable. This short nipple also leaves too little space between the fittings. Good refinery practice is to cut nipples so the distance between the threaded ends will be about equal to the diameter of the pipe. Thus a nipple of 3-inch pipe should have a space of 3 inches not threaded.

Here is what G. P. Crutchfield had to say of the few imperfect threads of every pipe joint in his paper read before the Breckenridge meeting of natural gasoline plant operators:

"It is these last few imperfect threads that are the cause of a big percentage of poor and leaky joints. If it is necessary to screw a joint upon these poorly formed and incorrectly tapered threads to make a solid joint, the strain, distortion and false tightness are sure to cause trouble later.

"The cause of these poor pipe joints is generally the result of a poorly adjusted stock and die. This may be remedied by readjusting the dial, the Beaver type by correcting the calibra-

(Continued on page 28)

Advertising Eliminates the Jobber

Dr. E. R. Riggs sells his output direct to retailers, even when his prices are above the fixed figure

By Grady Triplett

IT is a rare thing to find a small skimming plant, which keeps up capacity operation day after day and through all seasons.

It is more than rare to find one that keeps up this continuous operation and also sells its output through its own fleet of trucks.

Then it is a triple rarity to find a plant operating at capacity, selling its whole output through its own trucks and also selling gasoline for more money than the common charge for a city or district.

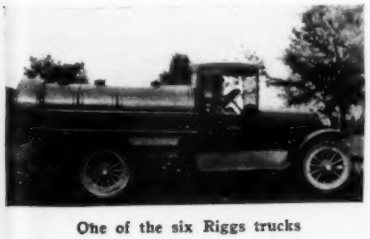
The plant combining all these is the Riggs Refinery of Bowling Green, Kentucky. It has been in operation three years. Except for recharging, cleaning and repairs, the one still has been in steady use for that time. Fewer than a dozen tank cars of gasoline have been shipped from the plant. That was during the first weeks of operation when local distribution was being developed.

Since then the gasoline and kerosene from the plant have been sold strictly through Riggs trucks and at tank wagon prices. Even when rival concerns reduced the tank wagon and service station margin a cent, giving gasoline to the consumer a cent cheaper, Riggs dealers held to the old price and the business prospered.

To relate the methods of this accomplishment would require a minute presentation of Dr. E. R. Riggs. His case is the more remarkable because he had never operated a refining plant until he built the present one. He had been in the producing branch of the oil business several years. But he had never been on a refinery site until he decided to build his plant. Then he visited a few other plants to get ideas for building his. It was built under his supervision and is operated under his supervision. The selling plan is his. It involves his personality, which is something not easily transferred to paper.

His object in selling gasoline and kerosene through his own truck fleet was to permit him to receive the tank wagon prices for these products, instead of selling at tank car prices. That his object has been accomplished is evident from the fact that he has been operating three years at capacity, while other similar plants have shut down. Then he has been through a period of price reduction and has prospered from it.

The plant is small, being built for 300 barrels daily. During the past summer, however, it was pressed to a slightly larger capacity in order to keep up with demand. The owner is now considering the addition of another still for next summer. Building a small plant was part of the plan Dr. Riggs had for accomplishing his purpose. He wanted to make no more products than he could sell within the Bowling Green territory.



One of the six Riggs trucks

The Riggs Refinery of Bowling Green, Ky.

According to Dr. Riggs there are two essentials to selling the output of a small skimming plant at tank wagon prices. One is to offer a superior product. The other is to educate both dealers and automobile owners to appreciate the superior product. One is a question of manufacture. The other is a matter of advertising, another place where the Riggs personality has its play.

They hold some secrets around the Riggs plant for all of its smallness. It runs crude from the Bowling Green fields. This oil has excellent gasoline content but is handicapped with sulphur, something the Riggs process removes effectively. The treating process is not made public at the Riggs plant.

The purpose of manufacture at the Riggs plant is to turn out a gasoline, which will have exceedingly low carbon content, while temperatures at which it is run will give it quickness of starting motors in the winter months. Having both of these, the gasoline also has other valuable characteristics. The low carbon content is something that an automobile owner will come to appreciate over a period of weeks or months. Ease of starting, especially in winter, however, is a characteristic to be appreciated instantly.

All gasoline from the refinery is straight run. In all cases it is re-run, while at times the product is triple run. Whatever the requirement, the motto of the plant is turn out only gasoline with the lowest possible carbon content. During the summer of 1924, the demand for gasoline from the Riggs plant was in excess of the supply. Still the product was turned out as a re-run gasoline.

It is this care in manufacture, which gives the superior product. Before attempting to sell his gasoline, Dr. Riggs determined to offer a different and better gasoline than that commonly offered. Having the plant and the methods for refining such a gasoline, his next step was in educating the motoring public as to its qualities.

Refiners, who may look upon this as something to be accomplished after years of effort can take heart in the fact that within less than six months after Dr. Riggs had started operating his plant, he was selling all his gasoline at the tank wagon price through his own trucks and that he has never been forced to seek tank car outlet since then. His plant is small, of course. But the size of a plant can be made to fit any city or community that is to be served.

Here are Temperature Specifications of Comet Gasoline

Initial at temperature of not over	116
5% recovery at temp. of not over	150
20% recovery at temp. of not over	184
50% recovery at temp. of not over	230
90% recovery at temp. of not over	310
End point	370

Here is what Dr. Riggs thinks of advertising:

"If you have a product that is superior to that commonly offered it is not difficult to gain distribution. The buyer is looking for something a little better in all lines, whether it is shoes or gasoline. He expects to pay a little more for it. My experience with excellent gasoline is that it will move faster if a higher price is asked. The buyer, wanting a better product, expects to pay more for it. When the better product is offered at the ordi-

Just Deserts

RECIPE No. 1

FOR MAKING

LOW CUT (BOWLING GREEN ONLY) MOTOR PIE

To one motor add five gallons cheap gas. Stir 3 to 7 minutes with good starter. Add hot water to radiator q. s.; again stir until motor spews, allow to spew, spur and spitter until you finally get where you are going, being careful not to add too many dashes or pet names. Repeat several days, adding more cheap gas every few miles. Then place on mechanic's carbon removing table for one day.

If after you have walked home, kicked the cat through a couple of rooms and one window, fussed about a cold dinner and still don't feel just right, try

RECIPE No. 2

QUALITY SQUARE, MOTOR CARE

To any old motor add 5 gallons high grade, high powered winter

COMET

turn over with starter once lightly—an instantaneous humming of the motor indicates "ready to serve." Arriving at destination, let set in the cold all day. At night it will again be ready to serve without warming.

This copy, written after the fashion of the cook book, had a ring that brought results

nary price, he wonders why it is not higher."

Advertising with Dr. Riggs is a matter of getting the attention of users of a product in a way that will attract and hold attention. He has used the newspapers of Bowling Green and surrounding towns in his efforts and found them sufficient. But in no instance has he ever offered ordinary copy. His copy is the product of his personality, something that cannot be transferred to another refiner.

Frequently he has written advertisements around scientific principles of gasoline and its use. But in each instance, he so worded his copy that it had a popular appeal.

He prefers, however, to keep away from scientific subjects. His opinion of advertising is that the user of gasoline is not so much concerned with why his motor starts more readily as he is with the fact that the motor does start more readily. During the winter of 1924, he wrote dozens of half-page advertisements on the ease of starting a motor with Comet gasoline. These were brief advertisements, headed by two or three words in large type. But the appeal, as the illustrations prove, was in the text of the advertisements rather than in the size of the type.

The bulk of the advertising done for Comet gasoline was during the period when rival concerns were selling at a lower price. By advertising, he offset the effects of lower prices and gave his product the benefit of the educational value of the advertising.

The cut in gasoline prices at Bowling Green was confined to that territorly early in 1924. It amounted to reducing the margin between the tank wagon and the retail prices, with the former unchanged. This amounted to a reduction of one cent for the retailer. Dr. Riggs decided to leave the margin unchanged and encouraged retailers of his product to sell Comet gasoline one cent above the common filling station price. He outlined his plans for an intense advertising campaign. Most of the retailers agreed to the plan. Dr. Riggs, however, expected to lose at least one-third of his gallonage because of the price difference. His calculation was that the higher price would offset loss in volume.

Instead of a gallonage loss of one-third, his deliveries suffered but 5 per cent. The price for Comet gasoline remained above the market over a period of weeks. Finally marketers restored the 3 cent differential and prices became uniform.

This period of difference in prices not only proved that a gasoline can be sold above the market but also permitted Dr. Riggs to spread his deliveries and to gain customers, where he had never been able to reach them previously. These were customers who would have to have equipment on rental or some other basis before they could be induced to handle any gasoline.

While his price at retail was one cent higher and his tank wagon equal to other concerns, Dr. Riggs took this proposition to customers. He agreed to put in pumps and equipment as is the practice of marketers in Kentucky. But instead of the nominal $1 annual rental, he in turn sold the equipment to his customers. His basis of selling was this. He agreed to charge the whole cost of the equipment to a customer and allow the customer to pay for it at the rate of 1 cent a gallon on gasoline as it was sold through the pump. As Comet gasoline was then on a 3 cent margin, while others had 2 cents, it allowed the customer to buy equipment and still enjoy a profit margin equal to what he would enjoy if some other gasoline.

One restoration of the 3 cent margin by all companies, Dr. Riggs has leased some equipment as other dealers do. But he insists on contracts somewhat different from the usual lease. For rural customers, he insists on placing large tanks underground. Rarely does he take a rural customer who can not receive a tank truck of gasoline at each delivery.

The object of this, of course, is to reduce delivery expense. Instead of

A Cyclone, Tornado, Lightning
OR
EVEN A KISS
CAN WRECK YOUR HOME

MISTAKES

are expensive; guard against them. Don't let a nickel hide a dollar. A few cents saved on cheap gas may cost you dollars in loss of power, efficiency, time and repairs. Accurate

RESULTS

are certain with an adding machine, but no more so than with

COMET

It takes something unusual to get attention, even in selling gasoline

THERE ARE SOME

8:15 A. M.—R-r-r-r-r-r-r-r-r-r-r-r-r Choo-Choc—Chis—Ching C-h-u-u—u R-r-r-r Choo—Chis-Ch-u—p—p. R-r—r—r—r—r—. Oh, Henry! Bring me two gallons hot water.

9:15 A. M.—Good morning, Office Force. Good morning, Mr. Late. Mr. Ready Money was here at 8:30 to close for that Settle farm. Said he guessed you had forgotten your appointment and wouldn't wait. Oh! h—!

MOST OTHERS

8:15 A. M.—R-r R-r Choo-choo-choo-choo-choo.

8:20 A. M.—Good morning, Office Force. Quite cold this ing. Yes, indeed, Mr. Take No Chance. Mr. Look Ahead phoned he would be here at 8:30 to close for that $50,000 insurance policy. Good! Glad I am using COMET; might h missed this deal.

A Saving of Battery Recharging, Time, Temper and Money
For those who use

EXTRA QUALITY HIGH GRAVITY WINTER

COMET

This copy appeared when the thermometer was around zero

Why not have your own copy?

The man who is either managing or working for a refinery or gasoline plant has every reason to read a business paper telling what is going on in that industry.

During the past year The Refiner and Natural Gasoline Manufacturer has printed more than 50 articles of a technical nature of direct interest to refiners and natural gasoline plant people.

If you are reading a copy subscribed to by your company, or a sample copy, why not send in a dollar today and have the Refiner and Natural Gasoline Manufacturer sent to your home, where you can keep a file?

The Cost is $1 per year

USE THE COUPON NOW!

The REFINER and NATURAL GASOLINE MANUFACTURER,
Box 1307, Houston, Texas.

Gentlemen: Please find enclosed one dollar (check or currency will be) for which send me your publication for one year.

Name.....

With.....**Company**

Street and No.....

City.....

State.....

Refinery
Executive
Superintendent
Other Employee

Natural Gasoline Plant
Executive
Superintendent
Other Employee

(BE SURE TO CHECK CLASSIFICATION)

Pointers on Care of the Breaker Box

Paper read at plant operators' meeting under auspices of Association of Natural Gasoline Manufacturers

Screw for breaker arm spring.—The screw for breaker arm spring is not easily accessible and for that reason it may be neglected to be securely tightened, this will in time work out and invariably cause moving arm to stick. The screw should by all means be securely tightened.

Circuit breaker arm.—The circuit breaker arm is caused to stick by rocker arm screw being gummed up with dirt and oil, or side of breaker arm binding on screw head. By cleaning the shoulder of the screw with fine emery cloth it will also bring about more clearance thus allowing more room for any dirt that may collect which can then be removed by wiping when again cleaning. It is good practice when setting up the screw to back it out one half turn and then lock it, this will prevent movable arm binding on screw head, no side play of movable arm will take place as the arm spring is held tight by the arm spring screw.

Rocker Arm Roller.—The rocker arm roller is troublesome in that it sticks and by not revolving it wears a flat surface which in time causes trouble by decreasing gap between contact points. To prevent this make sure it does not bind against side of circuit breaker arm and that it revolves freely on the pin.

Cam.—The cam is sometimes placed wrong. It is stamped with an R on one side and an L on the other side. They stand for direction of rotate, either right or left hand determined by facing drive gear of magneto. There is the possibility of the cam being stamped wrong, but that is for you to decide when determining direction of rotation. In time the cam may show natural wear on surface making contact with roller. It rests with your judgment when to change a worn cam, as a worn cam affects opening of contact points.

Contact Points.—The adjustment of contact points is important, by all means have them adjusted to thickness of gauge—1/64 of an inch. The volume of spark depends to a great extent on the proper break of these points. When the points are too close they do not break clean as the arcing at the points causes the current to linger in the primary winding of the coil. When the points are too far apart they may not close tight enough to allow current to flow and in addition the opening of the points occurs too early and causes an unnecessary pounding on the roller. You will appreciate that in adjustment of points time of movement is a factor; this is evident when we consider piston travel from time set for spark and time actual combustion takes place. My experience has been that when points are too wide apart it causes preignition, demonstrated by a thumping knock in crank end of power cylinder and on the other hand when points are too close I noticed that the cylinder head gasket started leaking and violent knocking took place in power end of cylinder. In connection with these two indications loose-fitting crank bearings which are apparently OK while in operation are shown up when the breaker points are too close together. When this happens you would swear something tore loose in crank case.

Dirty contact points may cause sparking at points, a condenser of improper capacity may cause sparking by not being able to absorb the current, but where it is highly improbable that the condenser is not of proper capacity the only trouble you can have in the condenser will be either an open or a short circuit, either one of which will cause the magneto not to function, so the chances are you will have no trouble at contact points due to condenser. It is essential that points come together squarely; this is much neglected, you must exercise your own initiative to bring about this adjustment, by all means make them come together square, and a good practice is to round off the edges of the points. This will help to prevent pitting. Sometimes excessive pitting of points is an indication of condenser trouble. If in doubt better send magneto to repair station for test. In cleaning points with a file, use your judgment, do not file points away, just clean them, remember your doing the job. In advancing or retarding the spark keep in mind the distance between edges on gap on box is approximately 3/8 inches —sometimes it is greater due to improper box being used, perhaps due to wear. If the space is greater than what it should be it will throw rotor out of magnetic field.

Spark Plug.—The adjustment of spark plug points should not be more than 1/64 inch, in other words the adjustment should be the same as adjustment of breaker box points. If, however, you obtain better results by a closer adjustment of plug points it does not reflect on efficiency of plug; your particular engine may require a closer adjustment of plug points. The elements that make the spark are voltage and amperage. Amperage is the amount of current and voltage is the force that makes the current jump the gap between points. The current is demonstrated by the SPARK, which is the electricity passing through the air from one point to another. It has to overcome the great resistance of the air and working against this resistance it produces heat shown by a flame or spark. The voltage of the magneto is approximately 20,000 volts, the amperage 1/12 ampere. I should think we owe it to ourselves to study this magneto to understand why and how it produces a spark of 1/12 ampere under a pressure of 20,000 volts.

Safety Spark Gap.—In connection with the spark there is a part in the magneto called safety spark gap. It is in operation when the spark plug fails, due to open in circuit from magneto to plug or plug points too far apart. Its function is to provide a path for the current that fails to go through spark plug. If the safety spark gap did not function it would seriously affect the winding of the magneto. The gap is adjusted at the factory for 11/32 inch and it should not be tampered with unless you know what you are doing and why you are doing it.

---

making daily trips over each route out of Bowling Green, Riggs trucks go when there is need for gasoline at a pump. The farthest point reached is 24 miles out. Regular routes and regular schedules are not maintained.

Five trucks serve the refinery. Each truck may make both rural and city deliveries in one day. As deliveries, especially those to rural customers, are made only on order, the policy of the concern is to rush all orders.

To prove that his methods are not peculiar to one city, Dr. Riggs once introduced his gasoline in a small city near Bowling Green. At the time of gaining the customer, he requested that the gasoline be sold 1 cent higher than the market. The dealer was doubtful but agreed to try the price, provided the gasoline were advertised in a local paper. Dr. Riggs used space in the small paper, as he used it in Bowling Green. The result was that the gallonage of the customer was doubled, despite the higher price. Later this dealer raised his price to 2 cents above the figure of other gasolines and his gallonage never dropped.

Fully 75 per cent of the gasoline sold in Bowling Green is from the Riggs Refinery. Outside the city, this gasoline is half the gallonage within the territory served by the Riggs trucks.

Dr. Riggs believes an excellent quality of gasoline can be sold above the common tank wagon price at all seasons and in any community in the United States. To him it is a proposition of offering the excellent gasoline and then educating users as to its value.

Kerosene from the Riggs Refinery is sold in Bowling Green and its territory along with gasoline. It is not pushed with advertising, as gasoline is however. Gas oil is not run in the plant. Fuel oil is moved in tank cars to users in cities near Bowling Green.

Thrower Made Director

H. A. Thrower of the Phillips Petroleum Company of Bartlesville, Oklahoma, was elected a director of the Western Petroleum Refiners Association at the meeting in Tulsa, October 7.

Richfield Plant Complete Refining Unit

Continuous redistillation accomplishes elimination of impurities from gasoline

Los Angeles, Calif.—The newly completed Richfield Oil Company refinery at Hynes, California, in Los Angeles Harbor district, together with its steel storage and general pipe line system, represents an investment of approximately two million dollars, and is considered by oil engineers and specialists to be a most complete plant of its kind. The units so far installed were designed to handle fifteen thousand barrels of crude daily and have already exceeded expectations in capacity and efficiency. When the site was purchased, adequate room for expansion was provided and the present capacity can be quadrupled at a minimum expense.

This plant embodies many advanced and improved processes of distillation and are the result of many years of experimentation and research on the part of engineers and chemists of the company in conjunction with several of the largest and most important manufacturers of refinery apparatus and experts from the leading designers and producers of chemical equipment in the country.

In its constant effort to improve the high quality of its products, the Richfield Oil Company has been a pioneer in introducing exact science into refining and from the technical point of view, this new refinery is especially interesting in that it introduces to the oil industry for the first time, the exact procedure which characterizes other great chemical industries.

Over two years ago, engineers of the company commenced a series of experiments in commercial fractionation at the Richfield Bakersfield refinery and the results of this work appear in perfected form in the new refinery where refined oils are manufactured as definite chemical products rather than indeterminate mixtures—as an illustration—a chemically pure gasoline which is as nearly perfect for the requirements of the modern automobile motor as is possible in commercial operation.

This has been accomplished not so much by radical changes in refining methods, as by steadfast application of the fundamental principles of continuous fractionation and rectification on a commercial scale, which is especially important in the handling of crude oils from Southern California fields. These crudes contain a certain percentage of impurities that ordinarily distill over with the gasoline fraction, causing discoloration and unpleasant odor, with carbon deposit, when used in the internal combustion motor.

Airplane view of plant storage tanks of Richfield Oil Co. plant at Hynes, Calif.

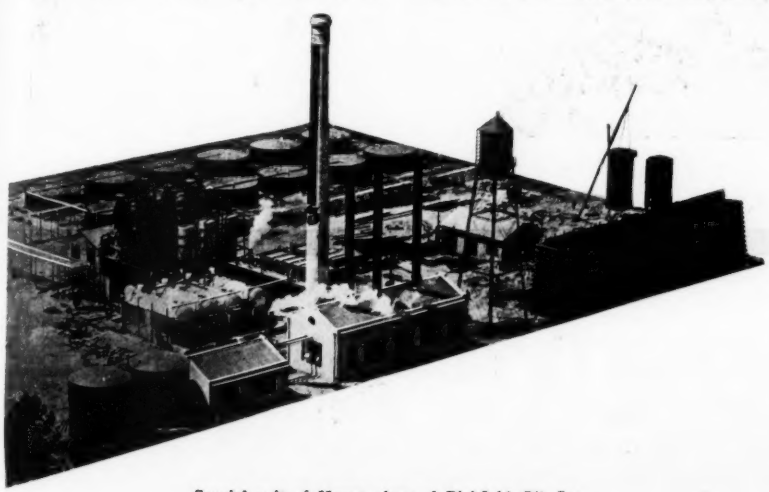
Redistillation Accomplished

It has been found that continued redistillation eliminates these impurities. By the new Richfield process, this redistillation is accomplished in a system of continuous rectifying columns, in which the gasoline is re-distilled some thirty times without the loss of the lighter and more valuable compounds which takes place in ordinary present day methods of refining. As an added safeguard, the company's engineers have developed a continuous treating process which completely removes any trace of acids or other impurities which might not have been wholly eliminated in the refining process. The result is that all Richfield gasoline will pass the so-called "Doctor Test".

Although great stress is laid on the production of high quality gasoline, the fractionating apparatus is so flexible and efficient that it permits the production of special distillates of very narrow boiling point ranges. These special products are employed by certain chemical industries, and must be of such a high degree of purity that they cannot be produced as satisfactorily in any other type of apparatus.

In addition to the technical aspects of this refinery, there are numerous other instances of advanced engineering incorporated in the plant which are of interest. To prevent any break in the cycle of manufacture, this new refinery has been made entirely independent of outside sources. It has its supply of crude from its own wells which is augmented by production under contract. This crude is delivered to the refinery through the company's own pipe line system, together with absorption gasoline produced by the Signal Hill Gasoline Company, an affiliated

(Continued on page 24)



Special unit of Hynes plant of Richfield Oil Co.

Braun

Absorption Plants

Braun Equipped Absorption Plant showing three Distillation Units, Gas Coolers, Water Cooling Tower, Absorbers, Etc.

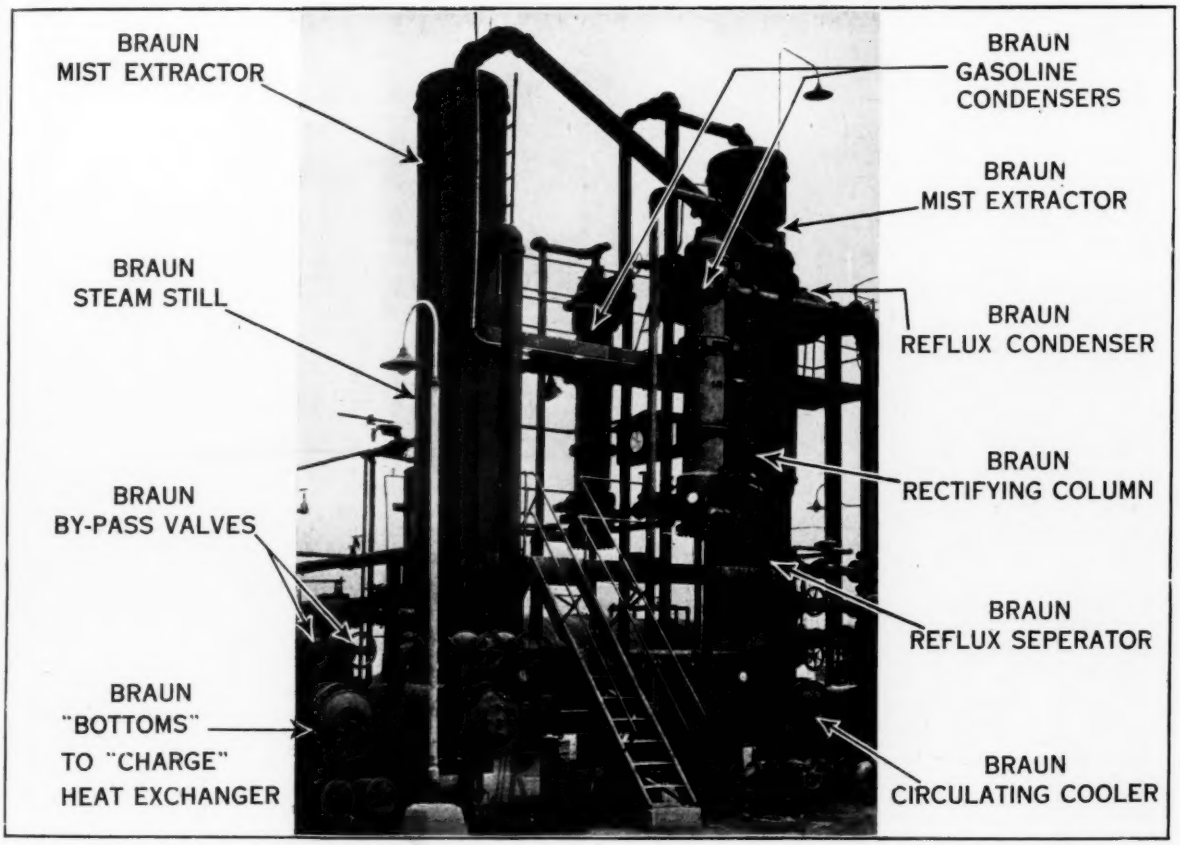
C. F. Braun & Co.

Manufacturing Mechanical Engineers
Factory & Executive Offices - Alhambra, Cal.
Midcontinent District Office - Tulsa, Okla.

Tell them where you saw the ad

Braun

Absorption Plants



Ten Thousand Gallon Distillation Unit—Over Forty Braun Equipped Absorption Plants in Successful Operation

C. F. Braun & Co.

Manufacturing Mechanical Engineers.
Factory & Executive Offices - Alhambra, Cal.
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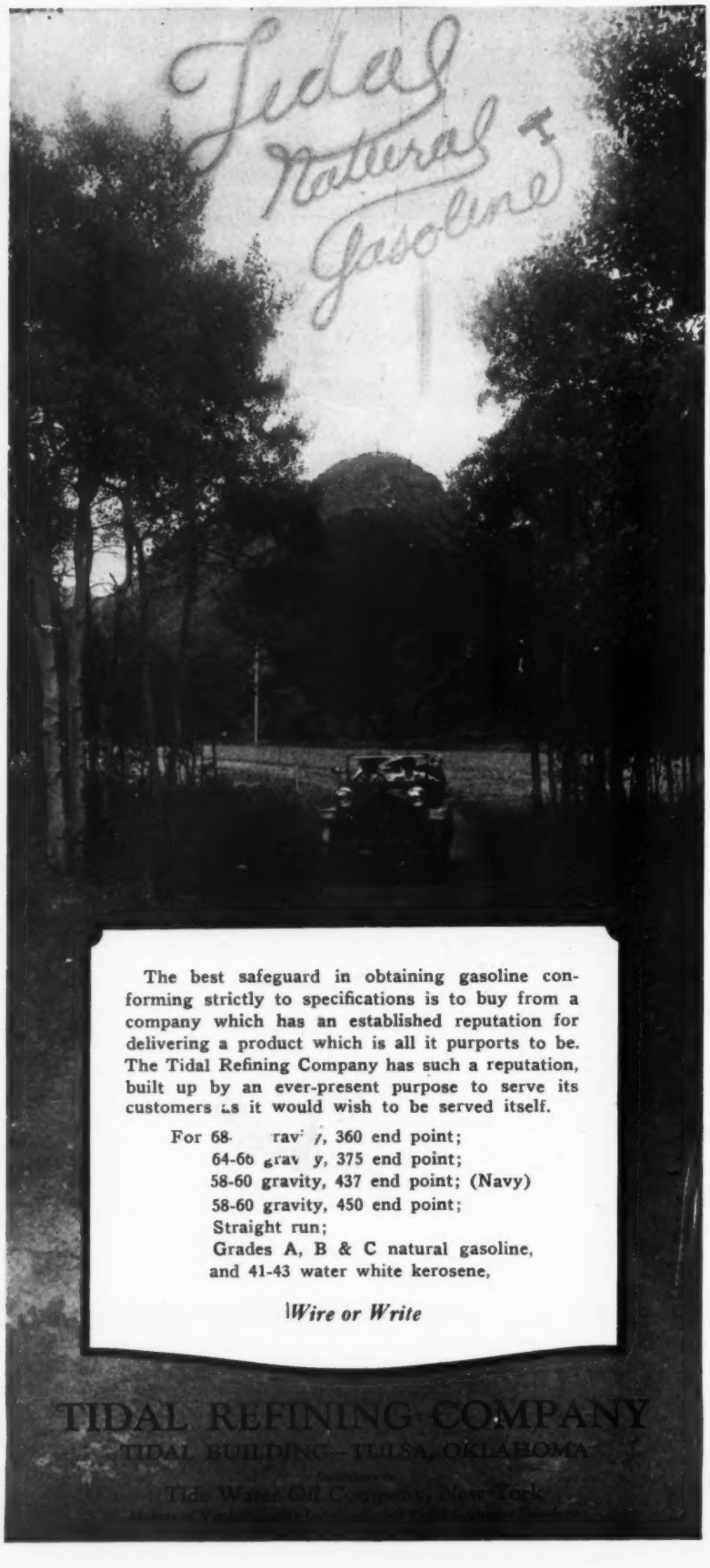
Tell them where you saw the ad



The best safeguard in obtaining gasoline conforming strictly to specifications is to buy from a company which has an established reputation for delivering a product which is all it purports to be. The Tidal Refining Company has such a reputation, built up by an ever-present purpose to serve its customers as it would wish to be served itself.

For 68- rav' /, 360 end point;
64-66 grav y, 375 end point;
58-60 gravity, 437 end point; (Navy)
58-60 gravity, 450 end point;
Straight run;
Grades A, B & C natural gasoline,
and 41-43 water white kerosene,

Wire or Write

TIDAL REFINING COMPANY
TIDAL BUILDING—TULSA, OKLAHOMA
Tide Water Oil Company, New York

Richfield Plant Complete Refining Unit

(Continued from page 21)

corporation, at its two plants in the Signal Hill field and additional supplies from large producers under contract. The plant is fully equipped to burn as fuel, either oil or gas, the gas being piped direct from the company's wells.

One particularly striking evidence of the foresight in designing and building this plant, is the installation of turbine operated electric generators which furnisn ample power and light for a complete electric system, independent of any power shortage. This system is equipped with duplicate units to provide against possible shut-down due to failure of any portion of the installation. The refinery has an abundant water supply from wells on the property; a modern high pressure steam plant; privately owned transportation facilities, including loading racks, spur tracks and tank cars; and a tank farm where approximately one million barrels of crude is held in reserve. The object of all this was to insure a steady flow of crude at all times into and through the plant and the uninterrupted delivery of refined products.

Fire Protection

Another important feature of this new refinery is its fire protection system. The nucleus of this system is a complete Foamite installation which not only protects all the tankage on the property, but is also carried to all operating units which present the slightest fire hazard. In addition to the Foamite system, a complete high pressure water system supplied by an elevated water tower in conjunction with a special underwriters' type fire unit, together with high pressure steam lines furnishes a threefold source of protection against any possible fire. All of the stills, fractionating towers and tanks are protected by adequate fire walls with drains, leading to an emergency pump at a safe distance from the plant. The safety vents of the stills and evaporators, ordinarily the source of most refinery fires, are protected by especially designed vapor proof release valves and are piped off to the emergency sump.

Throughout, the efforts of the company's engineers are seen to have been, first, to build a plant capable of manufacturing products of the highest obtainable standard; second, to insure against any shut-down due to accident or fire; third, to reduce costs through increased efficiency and economy of operation.

Its recent merger with the United Oil Company by whom it is controlled, places the Richfield Oil Company as one of the strongest and most important independent companies on the Pacific Coast, and with its new Hynes refinery giving added facilities to its refineries at Bakersfield and Los Angeles, where specially designed refining equipment similar to that at Hynes, is being installed; its rapidly increasing distribution through its division headquarters at San Diego, El Centro, San Bernardino, Long Beach, Pasadena, Pomona, Bakersfield, Fresno, Tulare, Modesto, Stockton, Reno and Sacramento, means an ability to keep pace with the growing demand for Richfield products, which has made the growth of this company little short of phenomenal.

Gasoline Being Extracted From Shale

Trumble process described by president of Colorado School of Mines

M. J. Trumble, inventor of the refining process in use in California by the Shell Company and the Trumble gas trap, has perfected a process for extracting oil and gasoline from shale in an experimental plant located at Alhambra near Los Angeles, and recently a large number of engineers from many of the leading oil companies of the country have made a close study of the process.

Mr. Trumble is extremely modest in making claims for his process, but recently Victor C. Alderson, president of the Colorado School of Mines, spent several days at the experimental plant, conducting a thorough investigation and later printing a bulletin describing the process. Mr. Alderson is conservative in his description, but he does go so far as to say that "The cost of producing gasoline is estimated to be less than by any other method now known."

It is generally understood, from conclusions reached after watching the operation of the experimental plant, that gasoline can be produced at a cost less than 5 cents a gallon from Colorado shale, exclusive of the mining costs but inclusive of the upkeep, interest on investment and depreciation of plant. Some engineers have estimated that the cost would be less than the amount given, but Mr. Trumble refuses to make an estimate, at least for publication.

The process is complete in that it produces gasoline in one operation rather than producing crude oil and then refining to secure the gasoline as in other processes. During the process sufficient gas and other fuels are produced to fill all needs.

Contract has been entered into permitting the use of the process by J. Edson Himes, 5300 Hyde Park avenue, Chicago, in a plant to be erected in Sweetwater county, Wyo., near Greenriver. At this time W. C. Kirkpatrick, engineer, is in Los Angeles as Mr. Himes' representative, making a close study of the process, preparatory to the erection of the proposed plant in Wyoming.

Mr. Trumble has also entered into a contract which permits the use of his process by the De Beque Shale Lands Company of Los Angeles.

Engineers representing foreign interests have been in Los Angeles during the past month investigating the process with a view of making arrangements with Mr. Trumble to use the process in foreign countries where oil shale is abundant.

In the July quarterly issued by the Colorado School of Mines, Mr. Alderson thus describes the Trumble process:

"The process is cyclic in character; that is, instead of producing the oil from shale in one operation and then distilling the crude oil into gasoline and other products in a second operation, the gasoline is produced from the oil shale through one continuous operation in which the crude oil occupies only an intermediate stage.

"After the plant is once started more heat is produced than is needed to run the plant itself and the excess can be used for other purposes.

"The power produced is sufficient to operate the cycle unit, to provide power for mining, transporting the shale, and disposing of the spent shale, with an excess of 50 per cent for other uses.

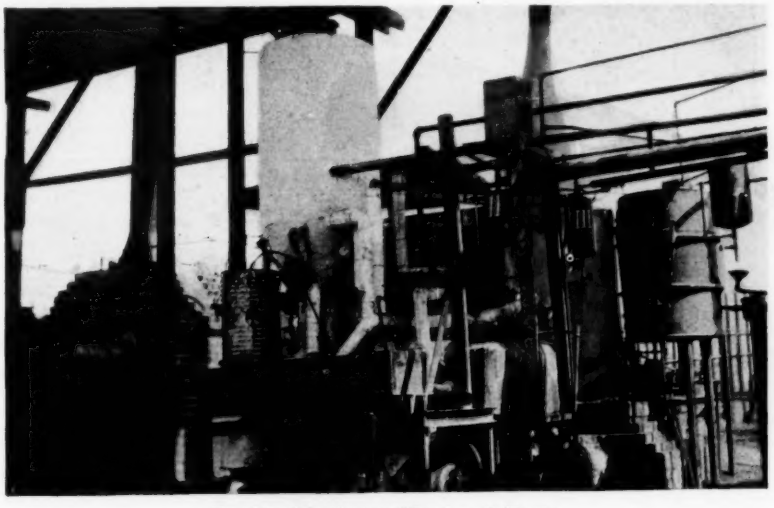
Equipment Used

"The shale, broken up to six-inch size including all smaller sizes, is first delivered to a preheater, above the retort, and subjected to a temperature of 400° Fahrenheit. This heat is produced in the process of decarbonization of the spent shale. The shale passes from the preheater down into the retort.

"The retort in which the oil is produced is 30 inches high, 14 inches in diameter, and holds a charge of 150 pounds. (The commercial size will be 6 feet in diameter and 20 feet high, to hold 15 tons.) The retort is of the vertical type with no internal device of moving parts for advancing the shale. The process is one of charging and recharging without loss of heat or continuity of operation. Vapors from the cracking still enter the lower part of the retort, come in contact with the raw shale preheated to 400°, lose a part of their own heat and thereby raise the temperature of the raw shale. Finally superheated steam is injected to complete the process of distillation and the production of oil and gas vapors.

"The entire product from the retort goes to the dephlegmator where a separation and condensation is made of the light and the heavy oil. The temperature is fixed for a light distillate, e.g., 48 gravity Baume. The light cut, or gasoline distillate, passes to an agitator, where the pyridene and other impurities are removed as an acid sludge. This sludge is re-distilled to recover the pyridene and the acid. The light cut gasoline is re-distilled in the presence of saturated steam and condensed into water white gasoline. The heavy cut is returned to the cracking still where it is re-cracked and follows the cycle.

"The cracking stills—horizontal, tubular, 36 inches long and 12 inches in diameter, three in number—(in a commercial plant 36 inches in diameter by 18 feet in length), receive the product of the dephlegmator; that is, crude oil. In each still are two tubes one within the other. Superheated steam is injected into the inner tube and supplies the heat for cracking. As heat is lost the resulting steam is returned to the superheater and the temperature raised to the necessary useful temperature of 1200 degrees. An ingenious revolving spiral device removes the accumulating carbon around the tube from which it is carried to a carbon pot, whence it goes to the accumulated spent shale.



Trumble shale plant at Alhambra, California

"The sulphate of ammonia is extracted by ordinary well known methods.

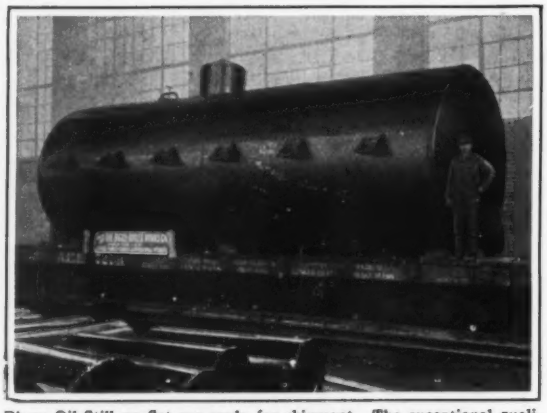
"The hot spent shale at a temperature of 1,000° [illegible] the hot carbon from the cracking stills, pass into the decarbonizer, which is also the preheater for the raw shale. This operation raises the temperature of the raw shale 400° before it goes into the distillation retort.

"The superheater is of special design and placed below the ground level. The boiler is placed above the superheater and is heated by the waste gases from the superheater. The superheater is installed in sections so as to act efficiently both in the first production of superheated steam and in adding heat to the steam returned from the stills.

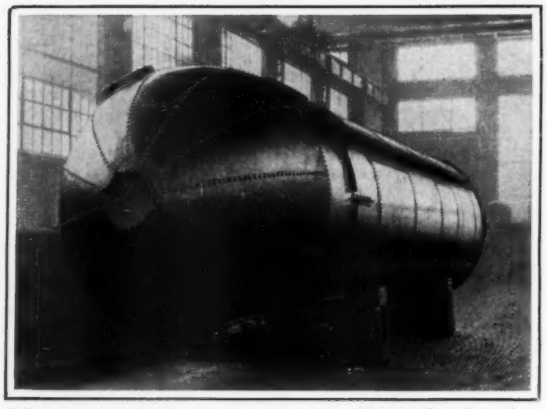
"Steam and oil vapors from the retort pass to a steam turbine. This is connected to a generator to produce electricity for general power uses.

"To start the plant wood kindling would be placed in the bottom of the decarbonizer and lighted. The decar-

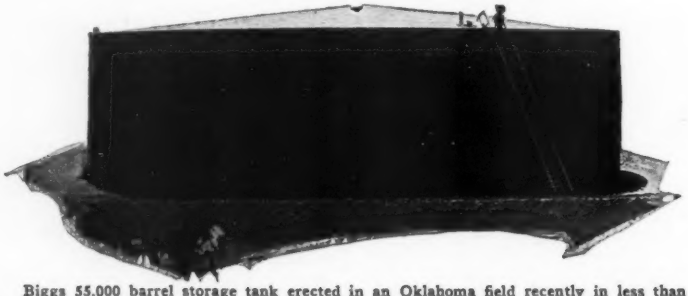
BIGGS



Biggs Oil Still on flat car ready for shipment. The exceptional quality of our riveting methods is an important factor in this class of work.



Agitator on test block. In the severe test which is given here, long and satisfactory service to the buyer of Biggs equipment is assured.



Biggs 55,000 barrel storage tank erected in an Oklahoma field recently in less than the time specified by the customer. Lower view shows same tank during process of erection.

Field Storage and

Tell them where you saw the ad

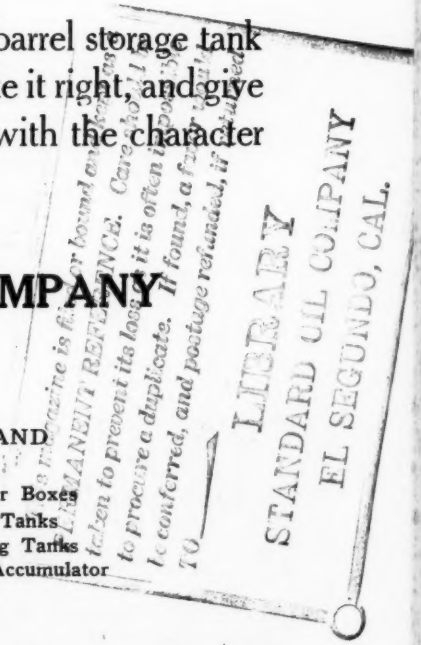
TANKS

Do You Know a Better Way?

THE best way for you to find out whether Biggs can serve you better than your present source or sources of supply is to give Biggs a trial.

You will not be taking any chance, for in this plant we don't know how to make anything except strictly high grade equipment. Our facilities, our methods, our experience, our standards,—all combine to produce riveted steel vessels that will give lasting satisfaction.

Whatever you require in steel plate, from an 80,000 barrel storage tank to a piece of filling station equipment, Biggs will make it right, and give you prompt delivery, at a price as low as consistent with the character of the work.



THE BIGGS BOILER WORKS COMPANY
Akron, 42; Ohio

Specialists in Riveted Steel Plate Equipment

BIGGS PRODUCTS FOR FIELD STORAGE AND REFINERY EQUIPMENT

- Storage tanks of 55,000 and 80,000 barrels capacity
- Fractionating Towers or Columns
- Dephlegmating Towers
- Pressure Stills for Cracking Process
- Steam Stills, Heat Exchangers
- Crude Stills, Condenser Boxes
- Agitators, Run Down Tanks
- Crude Storage Blending Tanks
- High Pressure and Accumulator Tanks
- Direct Heat Driers

"Biggs Riveted Tanks — Made Right, Always Tight"

Refinery Equipment

Tell them where you saw the ad

bonizer and preheater would be filled with raw shale. The burning of this raw shale produces gas which passes through a central compartment of the decarbonizer, and also through an ordinary gas scrubber, to the superheater and, on burning, starts the superheater and the cycle. After the cycle is once started the outer shell or chamber of the decarbonizer receives hot spent shale and hot carbon instead of the raw shale with which the start was made. Once started the cycle of operation is continuous.

"The steam passes from the boiler, under pressure of 100 pounds, to the superheater, then to the cracking still, then back to a superheater, then to the retort, and then is released through the steam turbine, then into the dephlegmator, and finally to the condenser where it is condensed along with the gasoline distillate, the water being returned to the boiler.

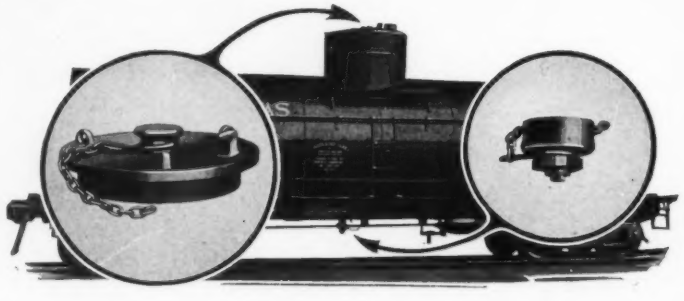
"Tests on the crude shale oil and the gasoline, made by Professor R. A. Baxter at the Colorado School of Mines, gave the following results:

"Crude Shale Oil—
"Gravity, 46.50° A.P.I.
"Saturation, 81 per cent.
"Color, 4.8 N.P.A.

"Gasoline—
"Color, approximately water white.
"Odor, pleasant and sweet.
"Doctor test, negative.
"Gravity, 68° A.P.I.
"Water and suspended matter, none.
"Acidity (distillation residue), neutral.
"Saturation, 84 per cent.

"Distillation—

"Overpoint	55° C.
" 5 per cent	58° C.
"50 per cent	92° C.
"90 per cent	155° C.
"96 per cent	158° C.
"Endpoint—	
"97 per cent	165° C.
"Residue	1.5 per cent
"Loss	1.5 per cent."



Only a Dome Cover!

A dome cover is just a dome cover, unless it bears our stamp of approval. Then it has a personality which means much to you.

Refiners' specialties, such as dome covers and outlet caps, are much alike to the casual observer. There is nothing spectacular about them. That's the reason it's so easy to go wrong.

Trust the product of the established manufacturer. It's the only way to be safe. Our stock specialties—dome covers and outlet caps—come to you backed by the reputation of an organization that tolerates no compromise.

Prompt handling of orders and the quickest possible shipments assured.

SPECIALISTS IN

Brake Shoes, Gray Iron Castings, Plate Work, Beams, Sheet and Structural Steel—quotations on request. Order by wire or letter.

Oil Well Rig Irons and Refinery Equipment

Western Iron and Foundry Co.

Wichita, Kansas

Methods for Getting A Tight Pipe Joint

(Continued from page 16)

tion on the adjusting dial; the Toledo type by a few turns of the die head before starting to cut the thread. A pipe fitter who wants to do good work and does not care to be haunted by a fear of leaks will cut his threads to make up tight without the last four or five imperfect threads engaging the threads in the fitting."

Before any pipe joint is made, all threads should be cleaned. Sand, grit or particles of steel may cause a defect in a joint that otherwise would hold.

Despite the care that is essential to the making of a good pipe thread, this does not insure a joint that will hold under the temperatures and pressures necessary to manufacturing petroleum products. The leak-proof joint is further insured by lubrication.

There are many lubricating products for pipe joints. But if the experience of natural gasoline men, as expressed at the Breckenridge meeting, is typical, the ideal one does not exist. The lubricant serves a double purpose. First it assists in screwing up the joint. Then it remains in the threads to seal any crevices left in the joint.

Around a natural gasoline p'ant the most difficult products to hold within a line are gasoline and hot mineral seal oil.

Shellac is credited with having characteristics that will hold on a gasoline line. The operators in the Breckenridge district consider this the best lubricant for a pipe joint on a gasoline line. But it has one serious objection. It leaves a joint that defies breaking out. Men at the Breckenridge meeting gave their experiences with trying to break out shellac joints, each having tried it without success, as damaged pipe results.

Litharge and glycerine, another combination that will leave a tight joint for a gasoline line, also offer the objection of a joint that can not be broken out without damaging pipe or fittings.

Nevertheless both shellac and the litharge and glycerine mixture are used daily in making pipe connections. That they will insure a tight joint when threads are perfectly cut is admitted. It also is admitted that these joints can seldom be broken out.

These products also are used on connections where lines carry hot mineral seal oil. They are less successful at holding oil at high temperatures, while they are as objectionable in the matter of disconnecting the joints.

A type of joint used at the Roser and Pendleton plant near Breckenridge is that of using ammonia fittings for mineral seal oil joints and soldering the threads. This is one joint that will hold mineral seal oil but it has its drawbacks. While it can be broken out by heating the joints, the objection is that excessive temperatures will melt the solder from the connections.

Sharpe Process Converts Natural Gas Into Series of Commercial Products

AN invention that makes a commercial product of every element of natural gas at an operating cost permitting extensive development has recently been perfected by William A. Sharpe, prominent electrical engineer, and is being distributed by the Consolidated Producers Trust, operating in the Wyoming oil fields. The new development combines in one operation several functions in the utilization of natural gas formerly performed by individual machines and promises greater efficiency and lowered operating cost for the process. Briefly the duties performed are:

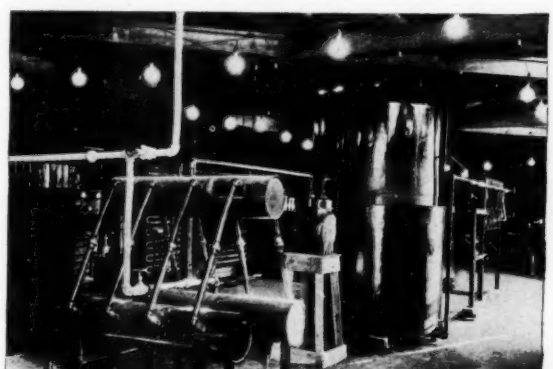
The utilization of natural gas for running.

The extraction of gasoline from the gas.

The carbonization of the gas and the utilization of the heat of carbonization for the generation of electricity.

The formation of carbon black on the walls of rotating boilers on which dry gas is burned.

The utilization of the steam generated by plant operation for the manufacture of ice. This, of course is contingent on the addition of an ice making plant.



Gravity gasoline extractor and gasometer. Gasoline extracted by freezing

In a test made recently at Lusk, Wyoming, in which 25,000 cubic feet of gas were consumed, from 15 to 18 kilowatts of electrical energy per thousand feet of gas were obtained; from 1 to 1½ pounds of carbon black per thousand feet of gas were recovered and from 1 to 3 gallons of gasoline recovered per thousand feet of gas.

Construction Original

The construction of the new plant includes many interesting features and some radical changes in former practice. The initial point of operation is a small engine designed for either steam or gasoline, but which is propelled by natural gas piped direct from the Western States well, some 29 miles northwest of Lusk. This engine operates a Westinghouse generator from which power is derived for use on the oven mechanism; it also puts the gas under pressure to cause refrigeration, which is used in connection with the gasoline extraction device.

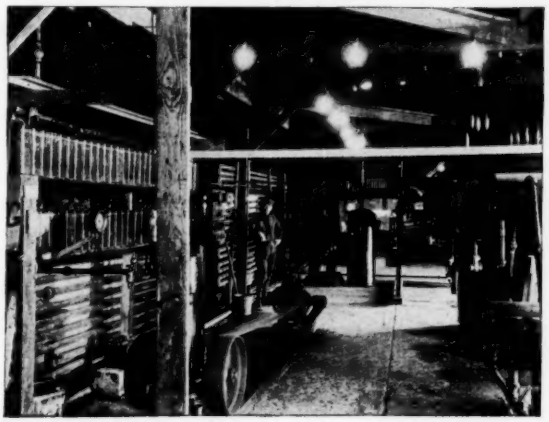
The extractor is composed of three cylinders, approximately 10 inches in diameter and 7 feet in length, having a capacity of about 20 gallons. Two of these cylinders rest upon the floor and apart about three feet. From the outer side of each cylinder a number of pipes extend upward some three feet, at an inward angle, and connect with and uphold the third cylinder, which is equi-distant above and between the two lower ones. This provides the greatest degree of circulation in the smallest possible space.

From the extractor the gas, now minus its gasoline content, passes through a meter and thence into a "gasometer," the common double-tank storage method used in all places where artificial gas is made for heating and lighting. Since it has been despoiled for its gasoline content the gas is now "dry." This dry gas, under gasometer pressure, goes next to the carbon oven for further and final despoilation. Under light pressure it enters the perforated lengths of pipe beneath the steel cylinders and is ignited. The many flames, showing retarded combustion, lap about the lower portion of the cylinders, and the heavy smudge of smoke rises slowly and lodges upon the cylinders. This is the carbon black.

Process Uniform

Unlike the ordinary process of making carbon black, wherein the flame is directed against the bottom of a steel pan, resulting in uneven burning of the carbon, this new process makes possible the production of a carbon black product of uniform quality. The cylinders are made to rotate slowly in pairs, one towards another, the scraper blade removing the carbon and causing it to fall into grooves, from whence it is taken by worm conveyors and dropped into receptacles underneath the oven.

The steel cylindrical boilers are kept one-third filled with water, renewal of supply being made to offset loss from steam formation. The water circulation reduces the temperature of the cylinders to a degree assuring the carbon black against being burned. The steam generated within the boilers passes into a manifold pipe and thence to a Westinghouse turbine generator which is used for the generation of electricity. In the plant at Lusk no ice making unit was installed, and the steam, therefore, was carried off through a steam exhaust pipe.



Gas engine operating Westinghouse generator from gas well pressure

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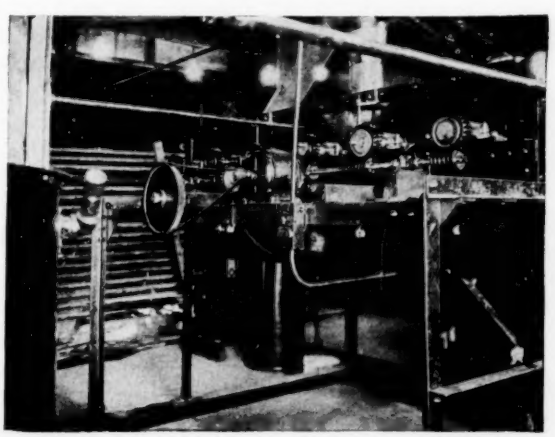
New York, N. Y.—The Ethyl Gasoline Corporation has been organized by the Standard Oil Company (New Jersey) and the General Motors Corporation with a capital of $5,000,000 in which the two companies are equal shareholders. The new company will take over the production and sale of Ethyl fluid which has been handled by the General Motors Chemical Company and will continue the marketing policies of that company.



Rear of carbon black converter, showing rotary boiler transmission driven by Westinghouse control

proving a surplus of strength

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Examine carefully the unretouched photographs of the tee, flange and union bonnet valve, and note particularly that even the threads did not fail.

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Vogt Drop Forged Steel Valves have working pressures to 6000 pounds per square inch, and fittings have working pressures as high as 10,000 pounds. Those designed for high temperatures are used successfully to 1100 degrees F. Valves are steel trimmed or monel metal trimmed according to service requirements.

Globe, angle and check valve sizes are from ¼ to 2 inches, gate valves from 1 to 6 inches, fittings from ¼ to 4 inches and companion flange sizes from ¼ to 8 inches inclusive.

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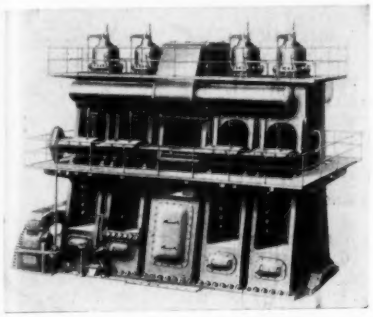
Worthington Perfects Improved Diesel Engine

A design of two-cycle, double-acting Diesel engine was recently announced by the Worthington Pump and Machinery Corporation. Manufacturers of the engine state that it combines a fuel economy comparable with that of the best existing types of Diesel engine, with dimensions, weight and construction cost per horsepower approaching those of reciprocating steam machinery.

Another striking feature of the design is the fact that the horsepower per cylinder can from all indications be carried to a far higher value than any yet attained in Diesel engines, thus increasing the field of possible usefulness of Diesel-type power.

This engine is conservatively rated at 600 to 800 horsepower for a single cylinder unit, at speeds of 90 to 120 revolutions per minute.

The basic principle underlying the Worthington engine may be briefly stated to be: in the four-cycle Diesel



Worthington two-cycle, double-acting Diesel engine

engine one stroke in four is a power-stroke; in the two-cycle engine one stroke in two; in the new engine every stroke is a power stroke. Its working cycle, therefore, is virtually the same as that of a reciprocating steam engine.

The cylinder of the new engine might be described as composed of two single-acting cylinders, opposed end for end and working in opposite directions, their respective pistons flanged to the same rod, the scavenging and exhaust ports, cooling water circulation and expansion provisions of the two being virtually independent of each other.

The valve gear presents no particular novelty in design. There are three fuel spray valves, one on top of the upper end of the cylinder, and two in the bottom head on opposite sides of the piston-rod, entering at an angle. One of the admirable points of the design is the ingenuity with which these two valves are worked out so as to give a uniform and symmetrical distribution of the charge around the piston rod.

The reversing mechanism is second only to the unique cylinder design. Each of the three valves has its own cam, all three geared to the same shaft. The cams are symmetrical, and all that is necessary to reverse the running direction is to shift all three cams simultaneously through 34 degrees on the shaft.

This is accomplished by a worm shaft, which in turn is actuated by an oil-operated hydraulic mechanism controlled by a four-way cock, this in turn operated by a single lever on the maneuvering platform.

The engine is started and stopped by a single lever, which as it moves forward successively opens the air starting valves, then the fuel supply valves, simultaneously closing the air starting valves; the lever being then capable of setting, by a ratchet and pawl, at any desired fuel supply. To stop, all that is necessary is to throw this lever back to the stop position.

The starting and stopping lever and the reversing lever, though independent of each other in all other respects, are interlocked so that the engine must be brought to a full stop before reversing.

Every effort has been made, in all the auxiliary mechanism as well as in the engine proper, to secure the utmost possible simplicity both in design and operation, that can be combined with the highest efficiency and reliability. Scavenging, cooling and lubrication, for example, are all believed to represent a new level of thoroughness and efficiency in Diesel engine practice.

Further information may be secured from the Worthington Pump and Machinery Corporation, 115 Broadway, New York.

Sectional Condenser Has Multiplicity of Uses

A condenser of particular interest to oil refinery men is illustrated below.

This apparatus, which is built in two or more sections, will operate either as a standard, reflux, or partial condenser, and can also be used as a condenser and heat exchanger at the same time.

For standard operation, the vapor enters the upper shell and passes down through the successive sections over the banks of tubes through which

G-R sectional condenser

water, oil, or other circulating liquid is flowing.

Used as a reflux or partial condenser, the vapor enters the bottom vapor connection, passing upward through the vapor inlet, and the lighter fractions leaving the upper outlet.

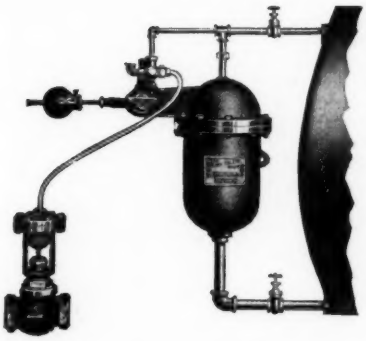
A still further arrangement of this condenser obtains a different "cut" or "fractionation" from each section. The lower vapor connection of each section can be offset to the side of the shell, and the distillate can be drained from the basin thus formed in the vapor space.

Besides flexibility of arrangement, flexibility of capacity is also obtained by adding as many sections as desired.

This steel shell condenser is quite compact, very rugged, and can easily be transported and assembled. Special features of construction provide easy cleaning and inspection without disconnecting water piping, and the use of rolled steel tube sheets prevents cracked plates or leaky tubes.

The G-R Sectional Condenser is manufactured by The Griscom-Russell Co., 90 West Street, New York, and is described in their Form 198, which has just been published.

Vigilant Oil Level Regulator



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Possibilities in the Low Pressure Cracking of Low Grade Fuel Oil

(Continued from page 15)

The foregoing, in sketching with extreme brevity the invisible and more or less intangible theoretical phases of the phenomenon of cracking, will serve to introduce and justify the proposed low-pressure process to be described in the following pages.

Great progress has been made during recent years in the development of commercially feasible processes for the cracking of either unrefined crude and residuum or of heavy distillates. There are now in successful operation a number of nationally known processes which are producing enormous quantities of cracked gasoline. Not only are these processes functioning satisfactorily from a technical viewpoint but they are also able to compete with straight topping distillation in the production of gasoline in the present depressed state of the market in practically all parts of the United States except the Pacific Coast.

On the Pacific Coast, and by that we mean California since that state is the only one in which petroleum is produced and refined in quantity, cracking is at present uneconomical because of the continued overproduction of straight run gasoline. The price level is such that it is impossible to produce cracked gasoline in competition with the uncracked product. However, the point at which cracking would be profitable is only slightly above the present level. Any substantial reduction in the fixed charges of a cracking plant would aid surprisingly in the adoption of cracking operations on the Pacific Coast. It is argued by many that the question of cracking in California is not so much a matter of price level as it is one of total quantity of gasoline produced. There is much more gasoline produced in California at present than the normal Pacific Coast marketing territory can consume. On the other hand, however, we must consider the fact that the great gasoline surplus of the Pacific Coast is strongly held. Practically all of it is in the hands of the big marketing concerns who are in no necessity of dumping their accumulated stocks on the market at any price. They sell what the market can absorb at a fair price. The market at present is world wide. What cannot be so sold is stored against a future demand. This is equally true of gasoline, fuel oil and crude.

So much for the present situation. As for the future, present indications are that the next summer season will draw heavily on the gasoline and tops (crude naphtha) stocks of California. The following season should find cracking operations in full swing. In the meantime there is plenty of time for experimentation in the development of untried or only partially investigated possibilities in the cracking field. It is the purpose of this article to briefly describe such a possibility.

Pressure in Cracking

Without going into a lengthy discussion regarding the use of relatively high pressures in the cracking of petroleum, suffice it to say that in practically every successful cracking process it has been found necessary to operate under pressure for two principal reasons. In the first place higher yields of synthetic gasoline are obtained. Secondly the gasoline produced under pressure is generally a much more desirable product from the standpoint of odor, color-stability, and other properties which are very important from the refining and marketing viewpoint.

The undesirable feature of cracking under pressure is the necessity of very expensive apparatus and the fact that even with the very best of design and the maintaining of only small quantities of highly heated oil under pressure at a time it is still impossible to eliminate the danger incidental to pressure distillation. Leaving the danger factor out of consideration and looking at the problem only from the direct cost angle it is evident that it would be very desirable to reduce the cost of cracked gasoline by substantially reducing the cost of the cracking plant required.

The proposed process to be described below operates at atmospheric pressure. Neither a commercial nor a semi-commercial sized plant has as yet been built but cracked gasoline produced in the laboratory under the conditions proposed for the large unit has been entirely satisfactory. The odor of the raw gasoline was very poor and the color was straw. However, upon treatment with Doctor solution and sulphuric acid in doses not exceeding twice those required to treat straight-run gasoline from the same crude, a finished product was obtained which was of good odor, 25 Saybolt Color, and stable for indefinite periods when not exposed to direct sunlight. When exposed to sunlight the product darkened from 25 to 28 Saybolt to from 21 to 22 Saybolt in periods ranging from three days to a week. This darkening in direct sunlight is not considered to be a serious matter as practically no gasoline marketed is exposed to sunlight for more than a few hours at most.

Proposed Plant

The plant as visualized at present by the writer and stripped to its bare essentials would consist of the following apparatus:

A vertical column lined with a highly refractory fire brick is filled with balls of an equally refractory material. This column has a grate near the bottom and a vapor outlet at the top. (See illustration). Near the top there is also a trapped inlet for the balls. The latter enter the column covered with a coating of heavy residuum (fuel oil) or ahphalt. While they are in the column they are stripped of their asphaltic coating at first by straight distillation, later by cracking distillation and finally the residual coke is partially converted into Water Gas and partly burned off the balls as they approach the bottom of the column. The clean balls are then carried up by means of a bucket conveyor and dropped into a bath of the heavy oil or asphalt to be cracked. From this bath they gravitate into the top of the column again, thus completing the cycle.

Draft through the column is induced by a blower or fan placed in the vapor line leading to the condensers. The condenser capacity need not be excessive as the problem is exactly the same as that met with in direct contact distillation apparatus of other types. At least one such direct contact process has been demonstrated to be successful.

Following are the processes which take place in the column:

The asphalt covered balls at a temperature of approximately 300° F. drop into the Distillation Zone. (See illustration.) The hot vapors and gases coming up from below heat this zone to an average temperature of 800° F. This causes the lighter liquid bodies in the asphalt to distill off. Those which will not distill near the top of the column will crack as the balls travel downward and the cracked vapors will pass out of the system. We now have balls covered with coke. At this point steam is injected into the column. For convenience we will call this part of the column the Gas Generating Zone. The steam reacts with some of the coke and Water Gas in formed. The balls, still covered with some coke, pass further toward the bottom of the column into the Combustion Zone. Here the system is open to the air, just sufficient air being admitted through the grate to cause complete combustion of the remaining coke.

Heat Balance

Below is given a theoretical heat balance for the process. It is based on the following considerations, being calculated for a semi-commercial sized unit:

1. One hundred barrels heavy residuum or asphalt to be run per day.
2. The residuum consists of 75% liquid and 25% solid (coke-like) substances.
3. The entire liquid portion is to be evaporated and cracked.
4. Less than one-third of the solid part to be burned as a source of heat.
5. More than two-thirds of the solid part to be used in generating Water Gas.

Calculations

Heat Used—To heat asphalt from 300 to 800° F. Specific heat of the asphalt is taken as 0.4. (100/24)x42x8.3x(800-300)x0.4=291,000 B.t.u. per hour. To distil and crack the liquid part of the asphalt. Latent Heat of Vaporization and Heat of Decomposition taken as 90 B.t.u. per pound. (100/24)x0.75x42x8.3x90=98,000 B.t.u. per hour. Heat of Formation of Water Gas, assuming two-thirds of the solid portion of the asphalt to be used for Water Gas formation. (100/24)x(0.25x2/3)x42x8.3=242 lbs. coke burned to Water Gas. Now 1 pound C plus 1.5 pounds H_2O=2.33 lbs. CO plus 0.167 lb. H_2=4,298 B.t.u. Therefore 4,298x242=1,040,116 B.t.u. per hour used in Water Gas reaction. Lost by radiation, etc., 25% or 650,000 B.t.u. per hour.

Heat Supplied—There are 121 lbs. Coke burned to CO_2 per hour. Hence 121x18,800=2,274,800 B.t.u. per hour supplied to system by combustion. There are 242 lbs. Coke converted to Water Gas per hour. Since 1.5 lbs. steam are required to convert 1 pound C into Water Gas we are using 242x1.5x1,156=419,600 B.t.u. in the form of steam. 1,156 B.t.u. is the heat content of saturated steam at 20 lbs. absolute pressure.

Summary—

1. Clay balls from the bottom of the column heat the incoming asphalt to 300° F.
2. 291,000 B.t.u. per hour required to heat asphalt from 300° to 800° F.
3. 98,000 B.t.u. per hour required to

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vaporize and crack 75% (entire liquid part) of the asphalt.

4. 1,040,100 B.t.u. per hour absorbed by the Water Gas reaction.

5. 648,200 B.t.u. per hour (or 25% of the total heat supplied) is lost by radiation.

6. 2,274,800 B.t.u. per hour supplied by the combustion of one-third of the solid part of the asphalt.

7. 419,600 B.t.u. per hour supplied by the steam injected into the Gas Generating Zone.

8. 615,300 B.t.u. per hour margin for control.

Heat Supplied—		
2,274,800	B.t.u.	(Item 6)
419,600	"	(Item 7)
2,694,400	"	
Heat Used—		
650,000	B.t.u.	(Item 5)
291,000	"	(Item 2)
98,000	"	(Item 3)
1,040,100	"	(Item 4)
615,300	"	(Item 8)
2,694,400	"	

Dilution of Water Gas by Combustion

Leaving the top of the column through the vapor line there is a mixture of oil vapors, steam, Water Gas and combustion gases. The oil vapor and steam will, of course, be condensed out. The Water Gas, however, will remain diluted with the combustion gases. The extent of this dilution will necessarily have a great effect on its heating value. Below are the figures covering this phase of the process.

We have 25% of solid asphalt of which 8.3% is burned as fuel and 16.7% is used in generating Water Gas. 8.3% of 100 bbls. asphalt=8.3 bbls. or 2,905 lbs. Carbon, which when burned with 415,415 standard cubic feet air (theoretical requirement) will give 415,476 standard cubic feet carbon dioxide and nitrogen. (CO_2=87,150 cu. ft., and N=328,326 cu. ft.)

16.7%C=16.7 bbls. or 5,845 lbs. The composition of the average Water Gas, according to Lewes, is 48.31% hydrogen, 35.93% carbon monoxide, 1.05% methane, 4.25% carbon monoxide, 0.51% oxygen, and 9.95% nitrogen.

In Water Gas made by this process (as here described) there would, of course, be no nitrogen (until diluted by the combustion gases) and on the other hand there would be considerable methane, ethane and heavier hydrocarbon gases. Figuring on the basis of 85% of the C burning to CO, the gasification of 5,845 lbs. C will give 374,665 std. cu. ft. Water Gas. The following formula, from Lucke, was used in calculating the above. One lb. C makes (29.8x plus 59.6) cu. ft. of gas. Here x represents the fractional part burned to CO_2.

The mixture of Water Gas and combustion gases will therefore consist of 47.5% Water Gas and 52.5% combustion gases by volume. The heating value of the mixed gas would be 140 B.t.u. per cu. ft. This is based on the assumption that the Water Gas in the

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mixture has a heating value of 295 B.t.u. per cu. ft. The methane and other light gaseous hydrocarbons which the gas will undoubtedly contain were entirely ignored in the above calculations.

The total quantity of gas generated is 415,476 cubic feet combustion gases, and 374,665 cubic feet Water Gas, equalling 790,141 cubic feet Mixed Gas of not less than 140 B.t.u. per cubic foot heating value.

Conclusions

The conclusions to be drawn from the foregoing appear to be:

1. That valuable materials in the form of gas fuel and distillates can be obtained from a residuum or crude too heavy to be marketed as commercial fuel oil.

2. That the distillates obtained will contain percentages of synthetic gasoline which can be varied within quite wide limits, depending on the operating conditions in the column of the apparatus and by the variation of the height of this column.

3. That the cost of a cracking unit as here proposed will be relatively low as compared with one of the pressure type. The possible design can be varied within wide limits and with the exception of the conveying apparatus everything can be built or adapted from standard refinery apparatus.

4. That the distillates produced can be rerun if desired so that cracked gasoline is the only product manufactured.

In connection with the first conclusion it may be pointed out that a process such as this would be particularly adapted to the handling a raw material such as Mexican Panuco crude. By processing a portion of such a heavy asphaltic crude sufficient light distillate would be produced so that after the removal of the gasoline the remaining distillate could be used to blend up heavy virgin crude. In this way a high grade of fuel oil can be produced in addition to the cracked gasoline manufactured.

While at present the fuel oil market in California is strong and firm at a good price this is not always the case. Only a few years ago most Pacific Coast refineries were limited in their output by the amount of fuel oil which they could sell. While not immediately in view such a condition is liable to come again.

As far as the product of the process is concerned the writer is quite sanguine. The rate of distillation and cracking and the percentage of the total distillate cracked can be controlled in many different ways, by the rate of circulation of the refractory balls, by the induced draft, by the amount of steam injected, and by the proportion of air admitted. All these controls tend to make a very flexible process. The best part of it all is that each of the above mentioned variables is subject to direct and positive control and very close regulation. This has been demonstrated in our experience with direct contact distillation apparatus of the non-cracking type.

It may be pointed out at this juncture that the capacity of a plant as here proposed is not limited by the rate at which the refractory balls can be circulated. Asphalt or heavy crude can be admitted into the reaction column through a nozzle in addition to that which is introduced as a coating on the balls. The main function of the balls is to provide a steadily downward moving stream within the column. Many attempts have been made to develop direct contact cracking processes by having crude or residuum drip down through an open column or else have it run over irregularly shaped packing in a tower. Many materials have been used as packing in experimentation along this line. Metallurgical coke, rock, steel turnings and the like are well known examples of such packing. All these attempts have encountered the same difficulty. The oil will run down over the material for a short time and actual cracking effects will be obtained. Then gradually but surely the semi-coke will begin to build up at some point not far above the combustion zone and soon the whole column will be plugged. Therefore it is absolutely essential that the packing of the column be kept constantly in motion, even if slowly. Finally, in order that jamming be avoided it is desirable that the packing material be as nearly round as possible.

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Los Angeles, Calif.—The Gilmore-Parrott Company, 1014 South Olive, Los Angeles, Calif., has purchased the natural gasoline plant owned by the Rochester Gasoline Company at Ivan, Texas, and will operate it. The plant has a daily capacity of 4,000,000 cubic feet of gas. This plant was built by Forrest Gilmore about three years ago.

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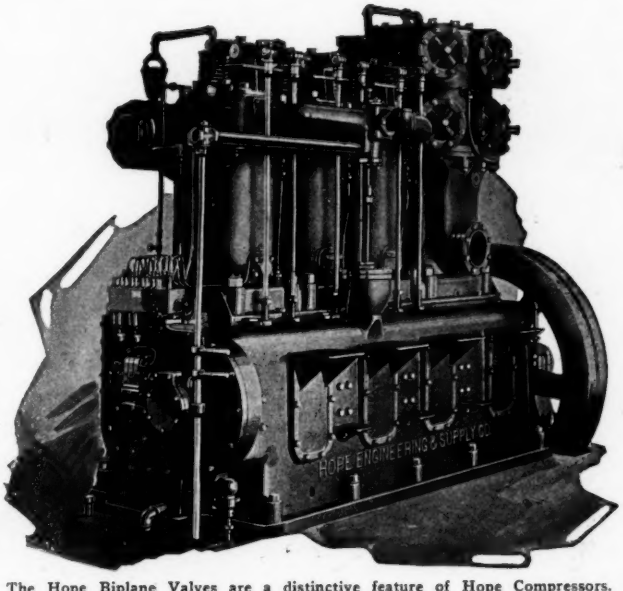

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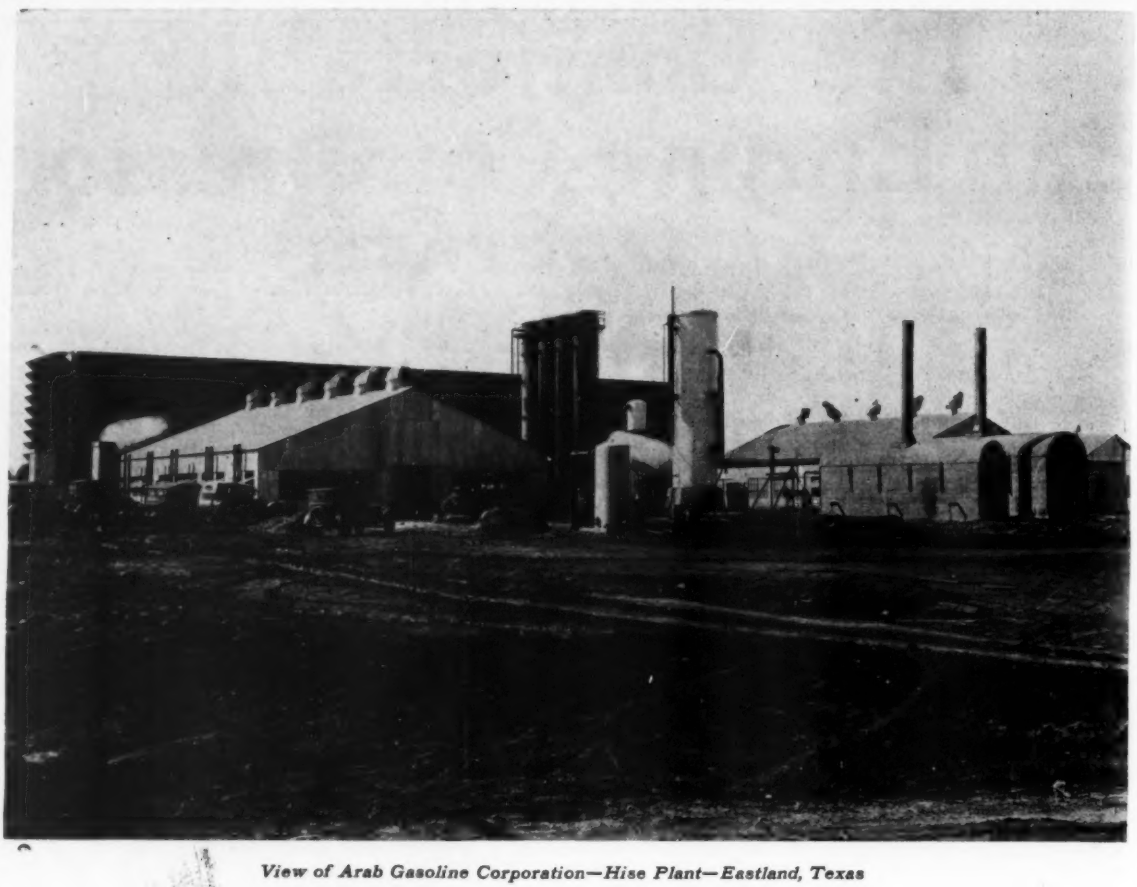

View of Arab Gasoline Corporation—Hise Plant—Eastland, Texas

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RECENT REFINERY PATENTS ISSUED

BY STAFF REPRESENTATIVE

Washington, D. C.—The following patents of interest to the oil refining industry were granted by the United States Patent Office during the month of September.

No. 1,506,877, granted September 2 to Joseph H. Adams, Flatbush, N. Y., assignor to The Texas Company, Houston, Texas, for a process of cracking hydrocarbon oils that consists in applying heat locally to a body of liquid in a combined cracking and vaporizing chamber, applying a cracking temperature locally to the vapors in said chamber, separating the vapors of the heavier and medium products from the lighter products, condensing the lighter products, returning the heavier products to the body of the liquid in the cracking chamber and returning the medium products to the source of supply.

This patent also covers a process of cracking hydrocarbon oil which comprises maintaining a body of liquid oil in a combined vaporizing and cracking chamber, confining a localized portion of said body and effecting its vaporization, subjecting the evolved vapors above said body to a cracking temperature, maintaining superatmospheric pressure on the oil under treatment, and withdrawing the evolved cracked vapors.

No. 1,506,878, granted September 2 to Joseph H. Adams, Flatbush, N. Y., assignor to The Texas Company, for an apparatus for the conversion and transformation of liquids, fluids and oils, comprising a receptacle, an electric oil heater in the lower part, and an electric oil vapor heater in the upper part arranged within said receptacle and a heat confining partition, having an oil inlet opening, interposed between said lower heater and the adjacent wall of said receptacle for the purpose of confining heat from the lower heater to a small localized portion of oil contained within the lower part of said receptacle to be volatilized and means for regulating the flow of oil into the lower part of said receptacle and the withdrawal of vapors from the upper part thereof.

This patent also covers an apparatus comprising a combined vaporizing and cracking chamber, means for supplying oil thereto and maintaining a predetermined level therein, means for heating the body of oil in the chamber to effect its vaporization, means for applying a cracking temperature locally to the evolved vapors above said body of oil in said chamber, means for maintaining superatmospheric pressure within said chamber, means for separating out the heavier and medium products from the lighter products, means for returning the heavier products to the body of liquid in the chamber and the medium products to the source of supply, and means for condensing the lighter products of desired volatility.

No. 1,507,634, granted September 9 to Harold E. Thompson, Clendenin, W. Va., assignor to Carbide and Carbon Chemicals Corporation, New York, for a process of making gasoline which comprises producing from natural gas a concentrate of its heavier hydrocarbons, separating from said concentrate a more volatile fraction and a less volatile fraction, rectifying said less volatile fraction in a rectifying column to produce a liquid and a vapor, compressing said more volatile fraction, cooling it by heat interchange with the vapor from the less volatile fraction, and expanding the material so cooled into the rectifying column at a point above the place of introduction of said less volatile fraction.

No. 1,507,659, granted September 9 to Elmer Billow, Evanston, Ill., assignor of one-half to Adolphus M. Allen, Chicago, for an apparatus for distilling mineral oil comprising an upwardly open receptacle containing a quantity of lead and means for heating said lead sufficiently to render it molten, a tower surmounting the lead container and sealed thereover to exclude air, openings in the tower at the upper part thereof, a plurality of oil injecting nozzles movably mounted adjacent each opening, arranged to be selectively registered therewith, and means for closing the opening to exclude air from the apparatus during the interchange of nozzles, said movably mounted nozzles constituting means whereby the feeding of oil through the said openings will be practically uninterrupted.

No. 1,507,692, granted September 9 to Francis H. Smith, El Segundo, and George J. Ziser, Los Angeles, Calif., assignors to Standard Oil Company, San Francisco, for a process of treating those light hydrocarbon distillates which contain compounds that, upon standing, form color bodies, which process includes aging distillate until the distillate has developed substantially its maximum color, and then removing the produced color bodies by contacting the distillate with an absorptive material.

No. 1,508,625, granted September 16 to Charles Walcott Stratford, San Francisco, for a method of clarifying and decolorizing petroleum products which consists in heating the clarifying agent, heating the petroleum product, continuously flowing the heated clarifying agent and heated petroleum product independently into a receptacle, mixing the hot petroleum product and the hot clarifying agent therein, overflowing the combined hot mixed product from the said receptacle into a second receptacle, mixing the combined hot mixed products therein, overflowing the combined hot mixed product from the second named receptacle into a third receptacle and likewise mixing and overflowing the combined hot mixed product from the immediately preceding receptacle through a plurality of receptacles and filtering the combined hot mixed product overflowed from the last of said receptacles whereby to separate the clarifying agent and the decolorized petroleum product.

No. 1,508,923, granted September 16 to Nicholas Shouldice Clarke, New York, assignor to Athabasca Oil Products, Ltd., Edmonton, Can., for an apparatus for separating oil from oil sands, consisting of a separating tank having an inclined bottom and a plurality of adjustably sliding gates to control the passage of material therethrough, and a plurality of rotary spray pipes in the said treating chamber, the said spray pipes being located between the gates.

The patent also covers an apparatus comprising a vertically extending stock, means for spraying the material passing therethrough, a separating tank connected to the bottom of the stock, means for causing the material to pass therethrough, controlling gates in the separating tank, and spray nozzles between the said controlling gates, and a continuous conveyor leading from the separating tank.

No. 1,509,325, granted September 23 to James W. Weir and William J. Ryan, Jr., Fillmore, Calif., for a process for lowering the cold test of lubricating oils which consists in combining with lubricating oil stock containing wax, a diluent and additional adding thereto a comminuted wax adherent medium, then chilling the mixture thus produced to congeal the wax upon the wax adherent medium, the diluted stock other than the wax remaining liquid and then separating the chilled associated wax and wax adherent medium from the liquid mixture.

No. 1,509,326, granted September 23 to James W. Weir, Filmore, Calif., for a process of treating mineral lubricating oils containing wax to effect both a decolorization thereof and a lowering of the cold test through the aid of a single substance, which includes treating the lubricating oil with a comminuted decolorizing agent at a temperature not substantially less than 250 degrees F. to effect a decolorizing of the oil, then cooling the mixture below the melting point of paraffin wax to congeal the wax throughout the decolorizing agent, and filtering the oil, below the melting point of paraffin wax, from the solid mass.

No. 1,509,667, granted September 23 to Robert M. Catlin, Franklin, N. J., assignor to Catlin Shale Products Company, New York, covering a process of distilling carbonaceous material containing a volatilizable portion and a combustible solid portion, which comprises feeding such material in a descending column, maintaining a zone of combustion at the lower part of the column by supplying a preformed incombustible mixture of air and incombustible gas to the lower part of said combustion zone, regulating the quantity of said air-gas mixture to maintain a distillation zone above the combustion zone, regulating the proportions of said air-gas mixture to prevent combustion in said distillation zone, leading off the evolved gases and vapors from the column above the distillation zone, separately obtaining

from said evolved gases and vapors the condensible portions thereof and also a supply of incombustible gas, and using said incombustible gas to form the incombustible air-gas mixture for subsequent distillation of carbonaceous materials such as described.

No. 1,509,819, granted September 23 to Robert T. Pollock, Brookline, Mass., assignor to Universal Oil Products Company, Chicago, for an apparatus for converting oil, consisting of the combination with a furnace of a continuous heating coil disposed therein through which oil is passed to be subjected to a cracking temperature, of an enlarged vertically disposed insulated expansion chamber located outside of said furnace, means for introducing the heated products of conversion from said heating coil to be discharged into the upper portion of said expansion chamber, a vapor discharge line leading from said expansion chamber near its upper end, a plurality of independently controlled residual draw-off lines leading from said expansion chamber at different vertical positions, independent means for controlling each draw-off line, and a carbon discharge in the bottom of said chamber, and means for controlling the discharge of carbon therefrom.

No. 1,510,353, granted September 30 to George M. Turner, Riverside, Calif., for a process of extracting gasoline from natural gas, comprising maintaining by the application of centrifugal force a banked up body of absorbing oil under centrifugal pressure within a casing, forcing gas containing gasoline to bubble through said banked up oil with sufficient pressure to overcome the centrifugal force applied to the oil, and separating the gasoline content from the absorbing liquid.

No. 1,510,354, granted September 30 to George M. Turner, Riverside, Calif., for an apparatus for using absorbing liquids to extract casing head gasoline from natural gas, which comprises a casing having a wall extending vertically, means for supplying gas and absorbing liquids to the interior of said casing, means for withdrawing materials treated, a rotor member within said casing mounted to rotate on its vertical axis in a horizontal plane, said means for withdrawing materials leading from a point positioned above said rotor member, said power means and rotor member together comprising means for forming and maintaining by centrifugal force a bank of liquid around the wall of said casing and having a thickness at least as great as the distance from said wall to said rotor members.

No. 1,510,433, granted September 30 to Fred E. Hosmer, Shreveport, La., for the recovery of gasoline from gas by a process which comprises compressing and cooling the gas, separating the condensate formed from the residual gas, evaporating high volatile oils from the condensate to form a residue of low volatile oils and scrubbing the residual gas with the said low volatile oils.

No. 1,510,434, granted September 30 to Fred E. Hosmer, Shreveport, La., for a process for recovering gasoline from natural gas and the like by scrubbing with oil, comprising the division of such oil to offer extensive surfaces at or near atmospheric pressure, collecting evolved vapors and gases, again subdividing the oil at a pressure materially below atmospheric and transmitting said evolved vapors and gases in countercurrent to said oil in the second subdividing.

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Truscon Laboratories Put Out Paint for Wet Surfaces

A product for coating a damp or wet masonry has been perfected recently by The Truscon Laboratories, Detroit, Michigan.

This material is known as "Stuccotex", and is put up in convenient size packages in such colors as white, cream, red, concrete gray, Bedford gray, Portland gray, tile red.

Manufacturers of this product state that it has no relation to an oil paint, or a cold water paint. "Stuccotex" is usually used on cement and masonry surfaces, especially if they are wet, although it can be applied to a dry surface also. This material is all inorganic and is non-perishable.

Literature and full information can be obtained by writing the laboratory.

New Plant Operating

Beaumont, Texas.—Magnolia Petroleum Company has completed and placed in operation a 15,000-barrel daily capacity skimming plant near its refinery and tank farm at Magpeco. This new plant will be used in topping low gravity crudes for fuel oil shipments, and the distillates removed from the crude will be diverted to cracking units at the refinery. A long wharf has been built at this skimming plant to permit tankers to unload Mexican crude, and take on cargoes of fuel oil, while the plant will also operate on Luling, Texas, crude and low gravity crudes from Oklahoma.

The higher gravity and better quality of gasoline produced by the Dubbs Cracking Process is not its only or perhaps even its greatest point of merit, but it should be a decided advantage to every refiner

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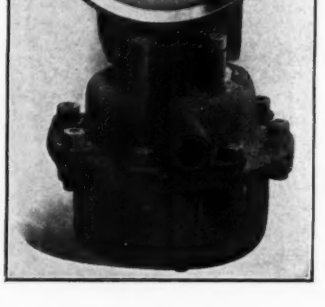

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Mid-Continent Refineries Show Increased Throughput for October

Tulsa, Okla., Oct. 22.—Mid-Continent refinery runs for the first of October shows an increase of approximately 18,000 barrels over the total for the first day of the month previous.

The number of barrels of crude run to refineries in this area was 343,000 barrels compared to a total of 335,000 barrels for September 1st.

The total for the state of Oklahoma was 152,100 barrels, an increase of 7,100 barrels over September 1st. The Sinclair Refining Company plant at Cushing was up 500 barrels over last month's total, while the Champlin Refining Company plant has increased to 11,000 barrels. The Cosden refinery at West Tulsa was running 19,500 barrels on the first day of this month, an increase over the runs for last month's first day.

The Tidal Oil Company refinery at Drumright reduced the crude runs from a total of 6,000 barrels for September to 3,500 barrels for the first day of October.

Total runs for Kansas refineries was 63,500 barrels, an increase of 400 barrels. This report does not include the Neodosha plant of the Standard Oil Company, which is reported to have increased the daily runs to approximately 5,500 barrels, an increase of some 2,500 barrels over the previous month.

In North Texas, runs for October 1st were 87,600 barrels or an approximate increase of 2,700 barrels. This increase was brought about in part by the opening up of the Crystal Petroleum Company plant at Burkburnett, which was taking 550 barrels daily on the October report.

North Louisiana shows a decrease in crude runs of 4,300 barrels, bringing the daily total down to 20,800 barrels. The Texas Company refinery is off 1,000 barrels from the total of last month and is now running 5,000 barrels. The Shreveport Producers and Refiners Corporation is also off 500 barrels. The Louisiana Oil and Refining Company plant at Shreveport is the prime factor in the Louisiana loss, showing a total of 4,000 barrels under the total for September 1st. This plant is now running approximately 5,000 barrels.

Arkansas is also showing a loss in refinery runs, with a total of some 400 barrels under the total for last month. The total runs as of October 1st was 14,100 barrels.

New Plant Operating

Fort Worth, Texas.—The Hart Oil Corporation has begun operating the first unit of its proposed 20,000,000 cubic foot daily capacity natural gasoline plant, located on the Mrs. J. B. Hart land on the Stephens-Palo Pinto county line. The absorption process is used in this plant with natural well pressure. The plant is in section 23, T. & P. Ry. survey, block 4, and it is necessary to haul the gasoline production to Breckenridge to market same, as the nearest railroad is more than 20 miles from the plant. J. A. Hart is superintendent in charge of the plant, and headquarters of the concern are maintained at 1111 F. & M. Bank building, Fort Worth.

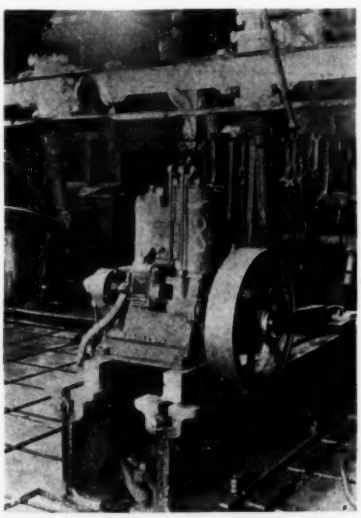
Air Starting Unit Made By Western Machinery Co.

A new improved air compressor set, especially suitable as an air starting unit for larger gas and oil engines, has recently been developed and put on the market by The Western Machinery Co., Los Angeles, Calif. This "Type CE" unit consists of a vertical 4"x3¼" air compressor driven by a 4"x5½" vertical gasoline engine. Both pistons are connected to the same crank shaft which gives a very compact and flexible unit. The air compressor valves are light steel discs, permitting to run the set up to 1000 R.P.M., although the normal speed is about 600 R.P.M., it requires only 15 to 17 minutes to pump up to 150 lbs. p.sq.in. an air tank of 24" dia. x 60" high, sufficient to start a 160 H.P. gas engine. However, this compressor set can pump air up to 225 pounds.

The main bearings are provided with high grade babbitt bushings, easily exchangeable, although the exceptionally large working surfaces reduce the wear to a minimum.

The lubricating system of the main bearings, pistons, wrist pins, cam shaft bearings and cam gears is of the splash type—simple but effective and reliable. Ignition is produced by a high tension magneto direct driven by the crank shaft. A very efficient water cooling is effected by a small plunger pump, actuated by a bronze eccentric from the cam shaft.

The Western Machinery Company has sales and service branches at Tulsa and Okmulgee, Oklahoma, Bakersfield and San Francisco, California.



Western Machinery Co. compressor set for air starting

New Plants Completed By Southwestern Company

Los Angeles, Calif., Oct. 14.—In the last sixty days the Southwestern Engineering Corporation of Los Angeles, designers and builders of refineries and absorption plants and manufacturers of refining apparatus, have completed the following work and contracts in the field:

A complete gasoline absorption plant with a daily gas capacity of 3,000,000 cubic feet was built in the Salt Creek field of Wyoming for the E. T. Williams Oil Company. This plant has been in operation for six weeks and has shown exceedingly high recoveries with unusual efficiencies in operation.

A complete gasoline absorption plant with a daily gas capacity of 1,000,000 cubic feet was built in the Maricopa field of California for the Interstate Oil Corporation.

In the Torrance field, a complete gasoline absorption plant has been installed for the Sentinel Oil Company. This is the second unit for this company and was installed in conjunction with and as an addition to the first plant to handle the increased flow of gas from the Torrance field.

In the Olympic refining plant at Long Beach, California, all apparatus exclusive of stills was furnished. The Olympic plant is a 2500-bbl. refinery and has been in operation for the last thirty days.

All heat exchange and condensing apparatus was furnished under contract for the new 15,000-bbl. refinery of the Richfield Oil Company at Hines, California.

Work on the Western Refining Company complete 15,000-bbl. refinery at Wilmington, California, is rapidly nearing completion. The Southwestern Engineering Corporation is building this refinery complete and it is anticipated that the first 5,000-bbl. unit will be ready for operation by the first of the year.

A complete 5,000,000 cubic foot capacity gasoline absorption plant is in course of erection in the new Dominguez Hill field of California for the Long Beach Gasoline Company. This is the third gasoline absorption plant built this year for the Long Beach Gasoline Company by the Southwestern Engineering Corporation.

The Southwestern Engineering Corporation is furnishing all distillation apparatus including pipe stills for the California Petroleum Corporation's new topping plant at Watson, California. The California Petroleum plant will be a 15,000-bbl. topping plant and will be arranged so that it can be turned into a complete through-run refinery without undue delay or supplemental equipment. This plant will probably be the finest topping plant on the Pacific Coast and will incorporate the best ideas and the latest technic in refining and topping plant practice.

During the last sixty days, demands for all steel refinery apparatus capable of handling high pressures and temperatures has resulted in considerable expansion at the Culver City factory. In order to maintain the production program on standard Southwestern equipment, all available yard room had to be absorbed for the installation of new and larger mechanical equipment.

Methods of Cleaning Pressure Tube Stills Described by Elliott Official

By F. H. Penberthy
Kansas City Manager, Elliott Company

TUBE Cleaners have been working in power plants for more than twenty years, performing a service perhaps more severe than that accorded any other tool used in the plant. Their record was well known to the refining industry and when development in the refineries went to tube stills, these cleaners were immediately pressed into a new kind of service. The tube cleaner is now as much a part of a tube still installation as it is of a water tube boiler installation.

In the past four or five years almost every refinery in the country has done some experimental work on tube and pressure stills; practically all refineries have installed, or are installing some kind of such stills. Among the more prominent processes in use at the present time are the Burton, Dubbs, Fleming, Holmes Manley, Jenkins and Cross.

In the "cracking" of oil by any of these processes, the apparatus used is very similar to a boiler of the standard water tube type. The oil passing through the tubes is heated to the temperature desired to drive off the different products—the different vapors of gasoline, kerosene, naphtha, etc. When the oil is heated in these tubes, it leaves a carbon deposit which has to be removed at the end of each run. The thickness of the deposit depends upon the kind of crude oil, and also upon the temperature and pressure applied. In most cases the carbon left on the tube is a very thin, hard coat, much harder than scale in boiler tubes, and the removing of these deposits represents quite a difficult problem for the tube cleaner.

In the cleaning of tube stills, two considerations are most important. First, the cleaning must be thorough so as to avoid blistering of the tubes and to obtain a high heat transfer through them. Second, the time required for cleaning must be a minimum, as the initial cost of the equipment is high and the time the still is down represents a loss of production.

Universal joint and drill

A proper cleaner for the work, then, is obtained, first by selecting a cleaner with sufficient power, and second, by utilizing cutting heads suitable for the kind of coke deposit to be removed. The coke will vary in thickness, and hardness in different tubes in the same furnace, as much harder deposits will form in tubes carrying the highest temperatures.

In the processes named above, the furnace tubes range in size from 2½" I. D. to 4" I. D., following very closely the water tube boiler sizes. For each size of tube, it is possible to furnish three different cleaners. When we know the thickness and hardness of the carbon deposit in the tubes, the cleaner having the proper power may be selected. The cleaner may be one with minimum power and air consumption, or it may be of maximum power and corresponding air consumption, or it may be between the two. In other words the cleaner should have sufficient power, but not an excess.

Lagonda air or steam driven cleaner with long surface cutting head

In the cutting heads there are a large number to select from. The standard cutter heads, as used in water tube boilers are used in many places, but in most cases, we recommend the type "SF" Head or the Long Surface Quick Repair Head, both illustrated herewith. Each type has a cutting and cleaning surface. These types of heads were developed primarily for the oil still work. Many times, however, the operation of the still has been such that there are patches of coke adhering to the tube which are almost as hard as the tube itself. In cases of this kind, the four-way drill with universal joint

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Figure 134.
SMALL TUBE TOWER PACKING
Especially adapted for the Cracking Processes

Figure 216.
SHALLOW ACID JAR
Jars made in capacities from 1 to 500 gallons. All designs

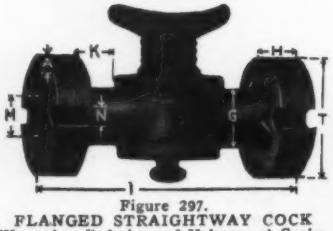

Figure 297.
FLANGED STRAIGHTWAY COCK
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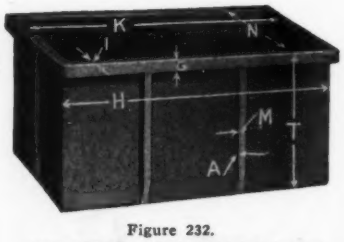

Figure 232.
ONE-PIECE ACID PROOF TANK
Our Booklet on "Tank and Tower Construction with Acid Proof Brick and Cement" will help you solve your large Acid Tank problem. Write for it.

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New Natural Gasoline Grades

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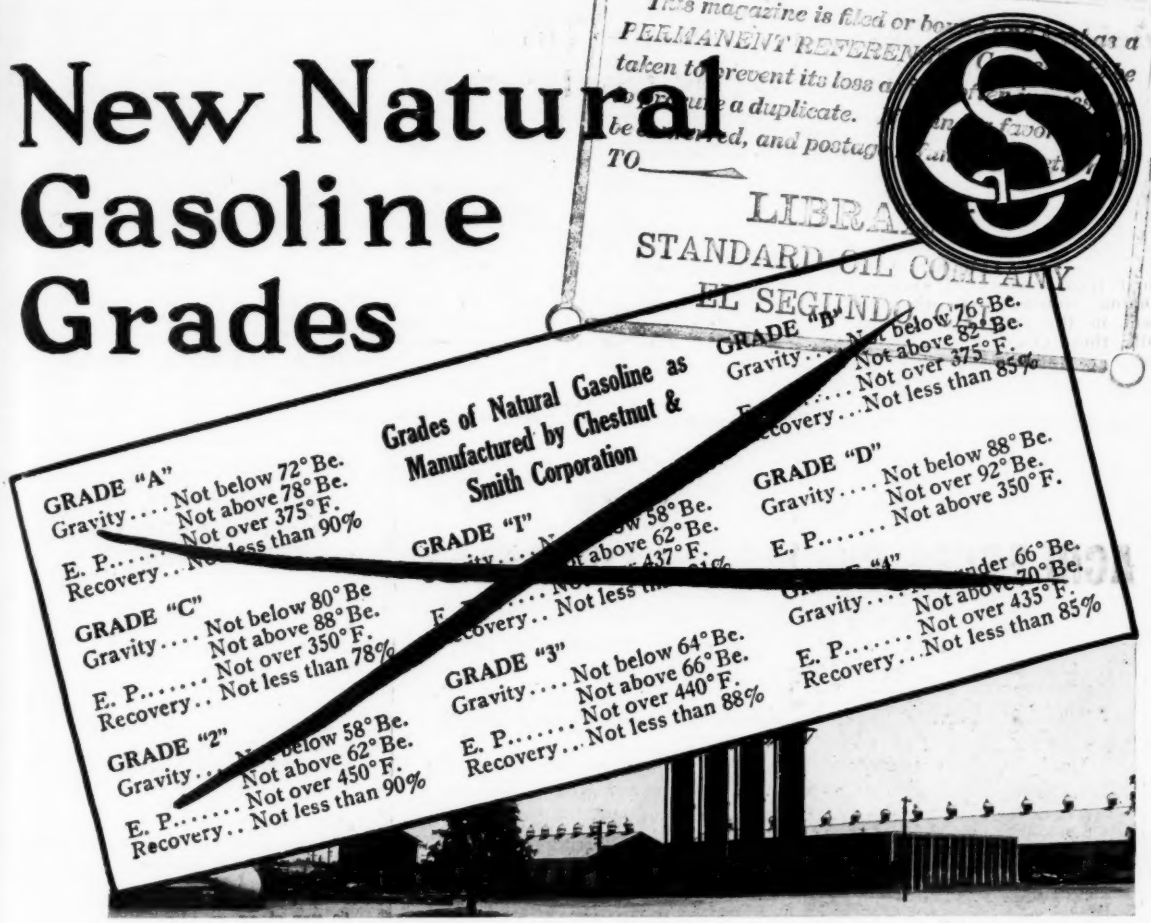
Grades of Natural Gasoline as Manufactured by Chestnut & Smith Corporation
GRADE "A"
Gravity....Not below 72° Be.
Not above 78° Be.
E. P.....Not over 375° F.
Recovery..Not less than 90%
GRADE "B"
Gravity....Not below 76° Be.
Not above 82° Be.
E. P.....Not over 375° F.
Recovery...Not less than 85%
GRADE "C"
Gravity....Not below 80° Be
Not above 88° Be.
E. P.....Not over 350° F.
Recovery..Not less than 78%
GRADE "D"
Gravity....Not below 88° Be.
Not over 92° Be.
E. P.....Not above 350° F.
GRADE "2"
Gravity....Not below 58° Be.
Not above 62° Be.
E. P.....Not over 450° F.
Recovery..Not less than 90%
GRADE "3"
Gravity....Not below 64° Be.
Not above 66° Be.
E. P.....Not over 440° F.
Recovery...Not less than 88%
GRADE "4"
Gravity....Not above 66° Be.
Not above 70° Be.
E. P.....Not over 435° F.
Recovery...Not less than 85%

Beginning October 1st, 1924, the old grades quoted above are obsolete. Below are the new grades as adopted by the Association of Natural Gasoline Manufacturers:

OFFICIAL NATURAL GASOLINE GRADES, EFFECTIVE OCTOBER 1ST, 1924

GRADE "DOUBLE A"		GRADE "DOUBLE B"		GRADE "C"	
Recovery	Not below 90%	Recovery	Not below 85%	Recovery	Not below 78%
Endpoint	Not above 375°F	Endpoint	Not above 375°F	Endpoint	Not above 375°F
Gravity	80.0 to 87.9	Gravity	84.0 to 92.0	Gravity	80.0 to 90.0

GRADE "A"		GRADE "B"	
Recovery	Not below 90%	Recovery	Not below 85%
Endpoint	Not above 375°F	Endpoint	Not above 375°F
Gravity	72.0 to 79.9	Gravity	76.0 to 83.9

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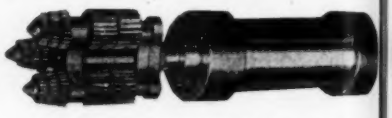
may be used to the best advantage. This type of cleaning, however, should be followed with one of the cutting heads similar to the "SF" or Long Surface Head.

In connection with most processes there are a large number of interconnecting pipes. These pipes must also be cleaned. We are cleaning pipes of this kind ranging from the smallest condenser tubes to pipes as large as 8 inch. An illustration of this is the Dubbs Process. The main furnace tubes are 4 inch straight, while the interconnecting pipe is 4 inch curved, 6 inch curved, and 2 inch straight. A cleaner has been adapted for each of these sizes of pipes.

In the beginning we stated that one of the vital points of cleaning was the time element. This is illustrated very well in the selection of equipment for the Cross Stills. The engineers insisted that cleaning should begin immediately after the furnace was shut down, which meant that the temperature on the inside was in the neighborhood of 500 degrees. To accomplish this, it was necessary for the cleaner to have room for the necessary expansion due to heat, and to feed the oil directly to the cleaner. This was accomplished by using a steam hose suitable for the temperature and equipped with automatic lubricator, feeding the oil directly to the cleaner. This application, as made, was very successful and enabled the operators of the Cross Stills to start cleaning immediately after shutting down. In this type of still the cleaning has been done with universal joint and four-way drill and long surface quick repair head.

Another application of interest was in a refinery developing a new type of still with vertical 4 inch tubes. While



Liberty cleaner with special "SF" head

this company was experimenting they tried to run the process as long as possible without shutting down. The cleaning had not been done as thoroughly as it should have been, and this left large patches of extremely hard coke in the stills. The cleaner which they had been using was next to the most powerful cleaner we make, but it was not performing the service. We later adapted the Tandem Type Cleaner with toggle joint and drill and were successful in cleaning these tubes in first class shape.

Another case of interest was one where a refinery was experimenting with very large pipes, and the still had been run until the pipes were practically filled with a very hard coke. It was impossible to get the ordinary cleaner into the tube. We finally arranged an external driven Center Drive Cleaner, and by putting the proper guides on the shaft, were able to clean these tubes so that they could go ahead with their experiments. This was interesting, as the tubes were about 30 feet long.

There are many stills made with curved tubes similar to the Stirling Boilers, and we have found that practically every one of these types are able to use cleaners of similar type to those used in locomotive arch tubes.

We have found that many of the smaller refineries in purchasing air compressors for operating cleaners have purchased them too small, thinking that they would operate but one cleaner at a time. As the time element is important, we believe that it is always well to purchase a compressor that will handle at least three of these cleaners at the same time. It is a paying investment.

If proper attention is given to the selection of a cleaner for oil still work, there is no reason why the tubes or pipes in any process cannot be cleaned quickly and thoroughly.

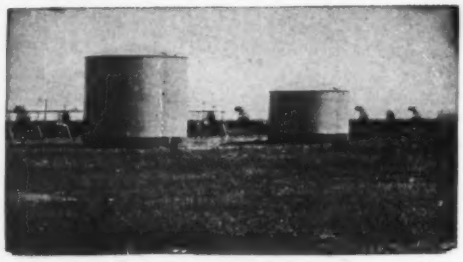
Gray With Shaffer

John L. Gray of New York and Denver, formerly president of the Barnsdall Refining Company, has been elected vice-president and executive manager of the Shaffer Oil and Refining Company, with producing, refining and marketing properties in the Mid-Continent and the Middle West.

Bulletin Available

The Tag-Mono, an instrument for recording the amount of air mixed with gas at the intake, is described in Bulletin No. 920, published by the C. J. Tagliabue Manufacturing Company.

The company is anxious to have the bulletin in the hands of superintendents of gasoline plants. It will be mailed when requests are sent to the office, 18 to 88 Thirty-third street, Brooklyn, N. Y.



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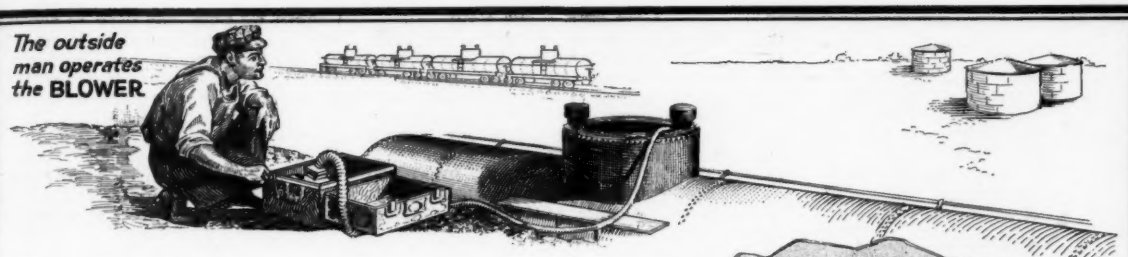

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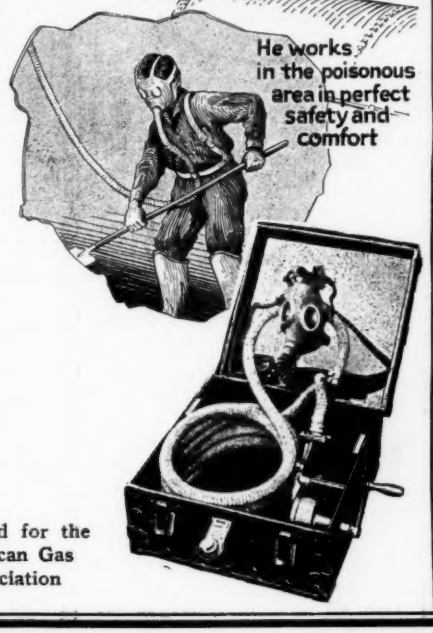

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Corsicana Plant Sold

Corsicana, Texas.—The Kent-Middleton Refining Company has purchased from Corsicana Oil & Refining Company a 250-barrel daily capacity complete refinery located near Corsicana. This plant has been idle for several years, and its new owners have announced that it will be reconditioned and placed in operation immediately. The Kent-Middleton Refining Company maintains headquarters in Corsicana, and recently purchased a skimming plant erected early this past summer by the Cross Refining Company at Angus. Garland Kent, who owns about 3,000 barrels daily production in the Corsicana-Powell field, is president, while J. E. Butler is vice president, and C. A. Middleton is secretary-treasurer.

Company Reorganized

Colorado, Texas.—The West Texas Refining Company, which is operating a 1,500-barrel daily capacity skimming plant on crude produced in the Mitchell County oil field, has been re-organized and the name changed to West Texas Refining & Development Company, following the purchase of one-half interest in the plant by the Hickok Producing Company of Toledo, Ohio. The new company is capitalized at $600,000, and the stock is owned jointly by the Anderson-Prichard Oil Corporation of Oklahoma City, and the Hickok Company. The officers of the West Texas Refining & Development Company are: L. H. Prichard, president; A. S. Hickok, vice-president; and J. Steve Anderson, secretary-treasurer.

Directors Elected

C. C. Peppers of Enid, Oklahoma, president of the Peppers Gasoline Company, and John L. Gray, vice-president of the Shaffer Oil and Refining Company of Chicago, were elected directors of the Western Petroleum Refiners' Association at the organization's meeting of directors held October 7 in Tulsa.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

Of the REFINER AND NATURAL GASOLINE MANUFACTURER, published monthly at Houston, Texas, for October 1st, 1924:

STATE OF TEXAS,
County of Harris—ss.

Before me, a notary public in and for the State and County aforesaid, personally appeared A. L. Burns, who, having been duly sworn according to law, deposes and says that he is the general manager of The REFINER AND NATURAL GASOLINE MANUFACTURER and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business manager are:

Publisher, The Gulf Publishing Company, R. L. Dudley, President, 1716 Dallas Ave., Houston, Texas.

Editor, Spencer W. Robinson, 1716 Dallas Ave., Houston, Texas.

Gen. Manager, A. L. Burns, 1716 Dallas Ave., Houston, Texas.

2. That the owner is: (If the publication is owned by an individual his name and address, or if owned by more than one individual the name and address of each, should be given below; if the publication is owned by a corporation the name of the corporation and the names and addresses of the stockholders owning or holding one per cent or more of the total amount of stock should be given.)

Jas. Anderson, Houston, Texas; R. L. Blaffer, Houston, Texas; Mrs. S. C. Blaffer, Houston, Texas; A. L. Burns, Houston, Texas; J. F. Carter, Jr., Tulsa, Oklahoma; R. E. Connell, Houston, Texas; H. W. Draper, Houston, Texas; Dr. N. L. Dudley, Goose Creek, Texas; R. L. Dudley, Houston, Texas; W. S. Farish, Houston, Texas; Dr. J. L. Gross, Kansas City, Mo.; Howard R. Hughes Estate, Houston, Texas; Chas. H. Lane, Houston, Texas; W. B. Larkin, Wichita Falls, Texas; J. H. McEvoy, Houston, Texas; J. H. McEvoy, Jr., Houston, Texas; W. A. Miles, Ft. Worth, Texas; C. F. Mirus, Tampico, Tamps., Mexico; Mrs. J. B. Moore, Houston, Texas; Wallace E. Pratt, Houston, Texas; Spencer W. Robinson, Houston, Texas; J. E. W. Schneider, Houston, Texas; C. N. Scott, Houston, Texas; R. S. Sterling, Houston, Texas; Jno. R. Suman, Houston, Texas; Wm. A. Vinson, Houston, Texas; Bud Waller, Chicago, Ill.; C. F. Williams, Humble, Texas; E. E. Watts, Houston, Texas.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

H. C. Weiss, Houston, Texas; Jas. Anderson, Houston, Texas; Howard R. Hughes Estate, Houston, Texas; R. L. Blaffer, Houston, Texas; W. S. Farish, Houston, Texas; Chas. H. Lane, Houston, Texas; John Hammon, Houston, Texas; R. S. Sterling, Houston, Texas; F. W. Kitchel, Houston, Texas.

4. That the two paragraphs next above giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is ..... (This information is required from daily publications only.)

A. L. BURNS,
Gen. Manager.

Sworn and subscribed before me this 6th day of October, 1924.

(Seal) Maurice Hirsh,
Notary Public, Harris County, Texas.
(My commission expires June 30, 1925.)

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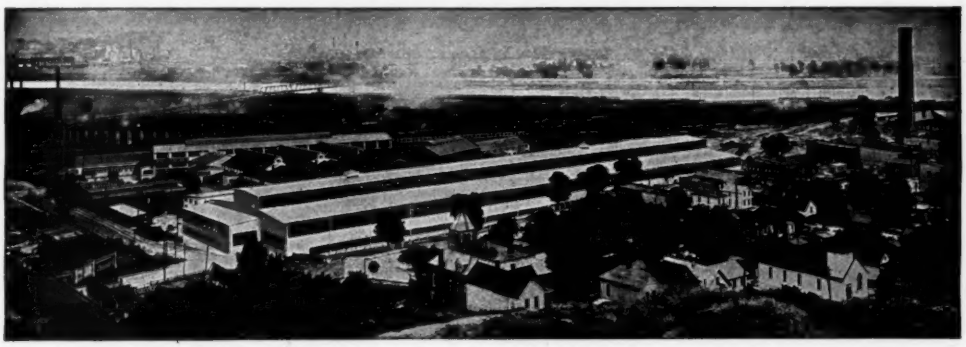

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Pure Water White	
Tanks .....gal.	.24 —.25
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90%	
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Drums .....gal.	.28 ....

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October .....gal.	1.03
Less carload, spot.....gal.	1.04
5 bbls. or less spot.....gal.	1.07
Boiled, tank spot.....gal.	.98
Boiled, carloads, spot.....gal.	1.04
Soya Bean, spot, tank.....lb.	.11¼

Animal Oils—

English Degras .....lb.	.04⅝
Domestic Degras bbls. carloads .....lb.	.04¼
Horse .....lb.	.09

Oleic Acids—

Dist. .....lb.	—.09¼
Saponified .....lb.	—.09¼

Lard Oils—

Prime	
Winter Strained .....1 to 1½ ffa. 40/45c. t. lb.	.18⅛
Extra	
Winter Strained .....2 to 4½ ffa. 40/45c. t. lb.	.17¾
Extra....4 to 5 ffa. 40/45c. t. lb.	.14¼
Extra No. 1 .....7 to 10 ffa. 40/50c. t. lb.	.12½
Extra No. 1 .....15 to 18 ffa. 40/50c. t. lb.	.12¼
No. 2..22 to 23 ffa. 40/45c. t. lb.	.11¾

Prime Edible Tallow under 1⅞ ffa.

40/45c. t. N. Y.....lb.	—.10
Tallow acidless .....lb.	—.11½
Lard Stearine .....lb.	—.18
Oleo Stearine .....lb.	—.13

Neatsfoot Oil—

Pure .....bbls.-lb.	—.15¼
Extra .....bbls.-lb.	—.12½
No. 1 .....bbls.-lb.	—.12¼
Cold pressed .....lb.	—.21

Fish Oils—

Menhaden Oil	
Light pressed .....gal.	—.64-.65
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Rosin F., N. Y.....bbl.	6.75
Rosin B.† .....bbl.	5.55
Rosin F.† .....bbl.	5.55
Rosin Oil 1st run.....gal.	.40
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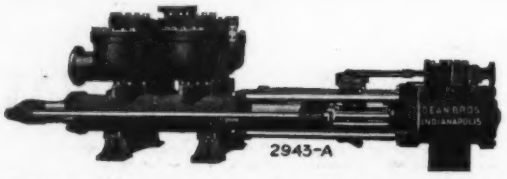

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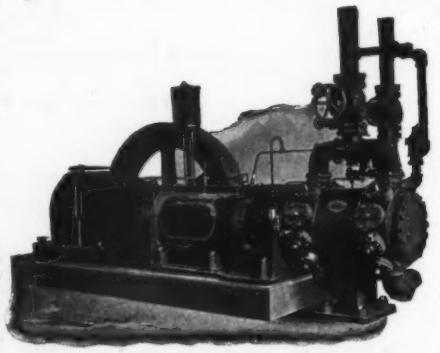

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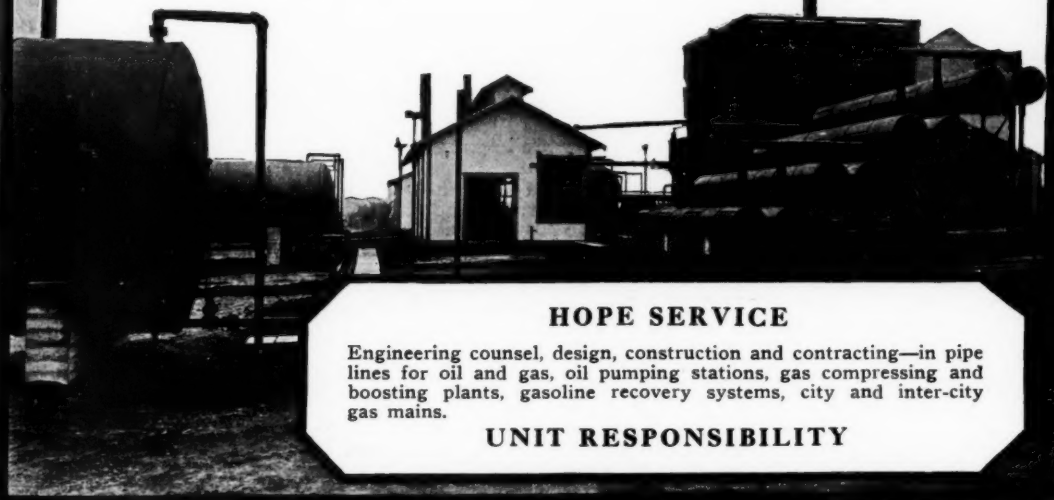

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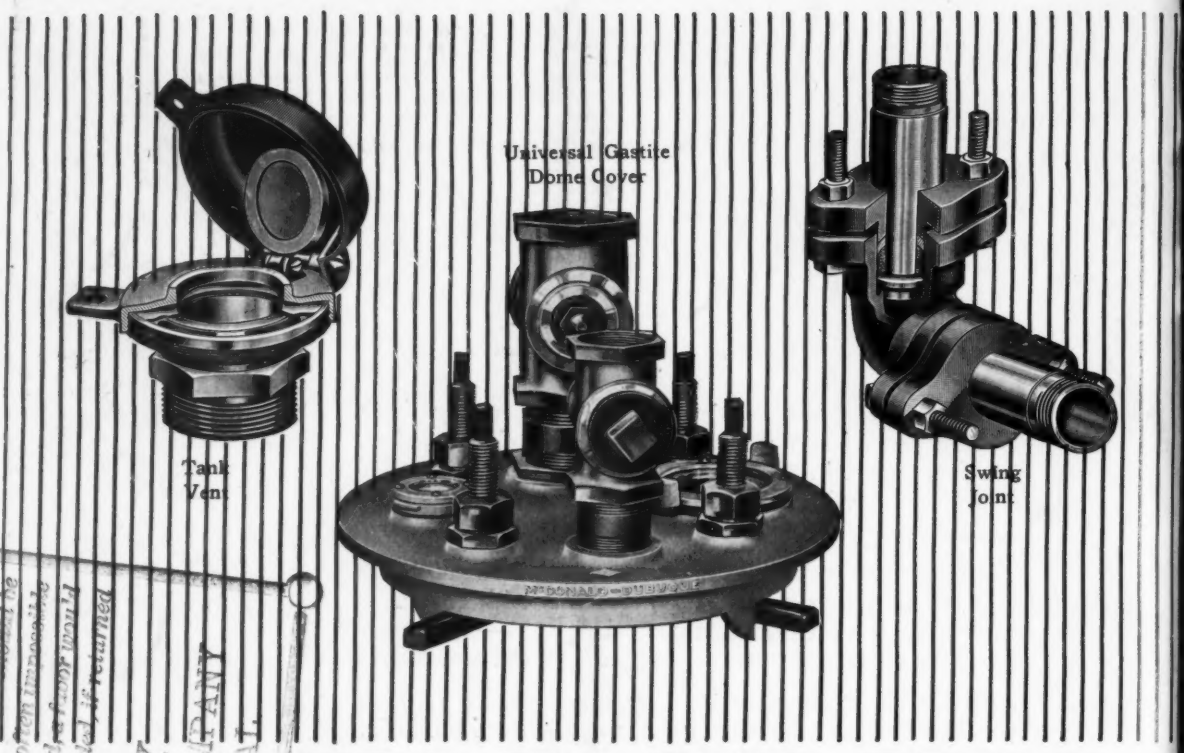

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